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Empire Electrical Trade

Production in the Dominions

LONG ago, when the world was in a happier state, there was some sort of balance between the economies of its many units. There were countries which were "primary" producers and exchanged their commodities with the others who were "secondary" producers or manufacturers.

Even before the 1914-1918 War, however, there were signs of change and the difficulties which that war imposed upon the free interchange of goods speeded up the process. The primary producers commenced to manufacture their own requirements and successive collapses of commodity prices forced them in many instances to intensify their efforts to become self-sufficient.

To trace out all the causes and consequences would be a long task and in any event would encroach upon the economist's preserves. What we are concerned with is the position of British electrical export trade, particularly trade within the Empire, which is our mainstay.

The principal Empire countries have all entered the electrical manufacturing field to a greater or less degree. While so far, generally speaking, the normal expansion of electrical applications has led to an increased demand from both home and overseas producers the tendency is one which merits consideration.

Canada has proceeded furthest in the matter of electrical manufacture for which, no doubt, the proximity of the United States has been responsible. In 1936 the production of electrical apparatus and supplies was valued at over $72 million of which about $3.5 million was exported.

Position in Australia

Mr. S. F. Ferguson in his article published in our April 21st issue stated that in 1937-38 the Australian electrical industry had an output valued at £4,297,000, while imports amounted to £3,693,000 from the United Kingdom and £1,269,000 from other countries.

Australia is now also looking for export markets for her electrical products. A Commonwealth electrical journal ("E.R.D.A.") recently advocated a survey of possibilities in the Southern Hemisphere, including Malaya, the Netherlands East Indies, Siam and Indo-China, and even Russia was suggested as a possible customer. Actually Australia's electrical exports last year were valued at only £193,272, of which £148,659 worth went to New Zealand, but the tendency is there all the same.

New Zealand has so far confined its attention to the smaller domestic appliances and accessories but the restrictions recently placed upon imports by the Government are likely to give an impetus to local manufacture.

South Africa has not gone very far in the setting-up of electrical factories. Cables and cookers are made by fairly large concerns and the production of lamps is contemplated. Industrialisation in India has not up to the present travelled in the electrical direction to any great extent although here again cables are produced, as well as telephone equipment, fan motors and lamps.

Is it Economic?

Let us say plainly that we do not dispute the right of the Dominions to set up factories. We merely question the wisdom of going too far in this direction when all we can offer if we are to purchase their primary products is manufactured goods. We also doubt the economic soundness of establishing manufacturing industries which can only be initiated and maintained by severe tariff or quota restrictions.

There are naturally doubts of this kind among their home customers who think that sometimes too high a price can be paid for the fostering of home industries. For instance an Australian correspondent recently reported (ELECTRICAL REVIEW, May 5th) that Mr. Forbes Mackay had protested against the high price quoted by Australian manufacturers for a quantity of meters. He pointed out that it was about 26 per cent. higher than a Canadian offer. This mention of a Canadian offer draws attention to a development which must militate against United Kingdom exports. In one respect, *i.e.*, the granting of Imperial tariff preference, it makes the competition more difficult to meet than that of foreign countries.

We hesitate to suggest another Imperial Economic Conference at this juncture, but there is room for an attempt to settle the rôle which each Dominion is to play if the British Empire is to be regarded as an economic unit.

In the meantime United Kingdom manufacturers must rely mainly upon their own efforts if they wish to retain and expand their Empire markets. They

must continue to impress upon Dominion customers that they have the resources and experience to enable them to produce the most reliable plant and apparatus at reasonable prices. They are also entitled to any help which the Government is able to afford by way of tactful suggestion to the Dominions that "reciprocity" is the surest way of strengthening Empire links and also through the Trade Commissioners in the various markets whose assistance can be most valuable.

A.R.P. and Fire Risks

RATHER more than twelve months ago a Committee set up by the Electricity Commissioners made recommendations regarding the precautions that ought to be adopted, as far as reasonably practicable, with a view to reducing fire risks in generating stations and sub-stations. The Committee had in view normal operating conditions, but later international developments make it necessary to inquire how far its findings apply, having regard to the possibility of an intensification of ordinary risks through attack by hostile aircraft. One important difference is in the precise meaning to be attached to the expression "as far as reasonably practicable." Originally, no doubt, it was intended to avoid over-insurance against contingencies that in all reasonable probability would never arise. Circumstances have now to be envisaged, however, in which not only would the chances of failure be very largely increased but also the consequences of failure would be far more serious. The relevant paragraphs of the Report, therefore, have more weight than ever they had.

Isolating Faults

WHILE the recommendations of the Commissioners' Committee on Fire Risks have acquired an urgency that was not anticipated when its members started investigations in March, 1936, there are further requirements to be observed in connection with air-raid precautions. Thus A.R.P. Memorandum C2, while recognising the considerable value of fire-resisting partitions between sections of switchgear, emphasises that for new work the aim should be distance separation. The relief of internal pressure due to explosion of electrical apparatus in buildings by making the combined areas of doors and windows equal to one-third of the total wall area, as provisionally suggested by the Committee, is no longer permissible. A solid switch-house construction is required with 14-in. brickwork or 12-in. reinforced concrete with a concrete roof 5-in. thick as a minimum, the relief being provided by a collapsible wall protected from shell splinters by an offset traverse wall. One of the principal outstanding questions is whether, in view of the heightened danger of fire due to damaged switchgear components, bus-zone protection designed to clear faults within about 0.2 sec. (probably a short enough time to prevent a fire starting) should be more widely adopted than it is at present.

Natural Electricity

SYSTEMATIC study of atmospheric electricity does not seem to be undertaken as much nowadays as it was a century or so ago. We are indebted to Mr. H. M. Sayers for the notes on these early investigations which are included in this issue and which bear on the recent discussion in our Correspondence columns. A cloud electrostatically charged and lying above a transmission line induces in it a charge of opposite sign, the potential of the line rising to a value dependent on the ratio of the cloud-transmission line capacitance to the transmission line-earth capacitance. In practice, the effect is often noticed on isolated lines and provision has to be made for discharging these potentials in the case of telephone wires and outdoor aerials, but there seems to be a dearth of information as to the actual magnitude of the voltages induced. In the case mentioned by the initiator of the discussion, the effect was no doubt accentuated by the use of v.i.r. cable for the line, and would have been much less noticeable with bare conductors owing to leakage over the damp insulators. It would seem worth while to observe such near-earth phenomena with the object of measurement, as we are incomparably better equipped for the task than were Crosse and Weekes, to whose work in this connection Mr. Sayers refers.

International Trunk Calls

THE Faraday Lecture on "The Long-distance Telephone Call" had the popular appeal it is intended to have and at the same time was obviously as much enjoyed by the large proportion of the audience which was made up of Institution members as it was by the guests. The greatest applause, however, was kept for the reference by Captain Cohen to the significance of the second half of the title of his lecture, "A Triumph of Engineering and Co-operation." Out of 40 million telephone subscribers in the world who are connected to a system valued at £2,000 million, no fewer than 37 million can talk to one another. This achievement is due to the working together of telephone engineers of all countries through the instrumentality of the C.C.I.F., which owes so very much to a former I.E.E. president, Mr. Frank Gill. There has been not only agreement in the principle that the technical preferences of individual States should be subordinated to the interests of the whole world system, but also the willingness to incur even considerable expense in modifying national practice in order to perfect international communication.

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Registered Contractors

AT last year's annual meeting of the National Register of Electrical Installation Contractors there seemed to be a feeling that the Register had passed its zenith. Mr. W. R. Rawlings, the honorary treasurer, then said "It is quite evident that the Register is now on the decline from the financial point of view . . . . there appears to be little hope of any increase in our income, but without doubt the expenditure will continue to rise." As things turned out in 1938 there proved to be an increase in income and a lower expenditure, although there was a net increase of only four in the number of contractors on the Register at the end of the year. As we have always insisted that the success of the Register depends largely upon its making itself known we are glad to see an increase in the item "Advertising and Publicity" from £286 to £341. Whether compulsory registration is likely to be introduced in the near future is problematical, but the mere "threat" of compulsion should lead many contractors to consider their position and look toward the Register.

Contractors' Conference

THE 1939 conference of the E.C.A. and Allied Associations should attract a good many members and friends. Brighton is an easy place to get to; there is plenty of accommodation; and an attractive programme is being arranged. We think delegates will appreciate the free afternoon which is provided for.

MAKING X-RAY EQUIPMENT

Quantity Production Methods in a Wembley Factory

THE making of X-ray apparatus in this country has assumed the dimensions of an industry, yet the word "manufacture" is hardly appropriate to the methods hitherto employed, for such equipment has tended to be made in somewhat piecemeal fashion to satisfy the fancies and prejudices expressed in users' specifications.

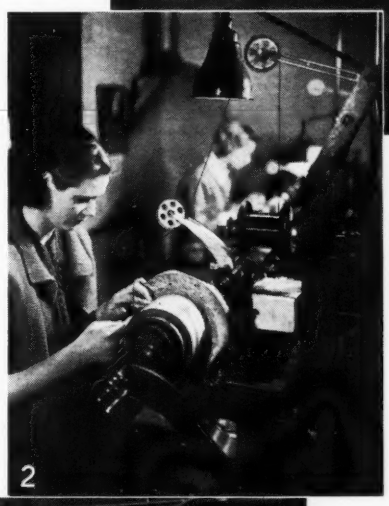
Individual production has been common practice in England since the inception of radiology, and particular interest therefore attaches to the factory of Watson and Sons (Electro-Medical), Ltd., where X-ray apparatus, short-wave therapy sets and such-like appliances are made on quantity production lines.

What is the significance of this venture? Not only is it a departure from firmly established custom, but large-scale manufacture means that the design of every piece of the whole, whether simple or complicated, must be correct from the start before the very considerable commitments involved in producing a large series can be embarked upon.

This can be assured by close study of users' preferences, in turn justifying more expenditure on design, which should improve quality and perhaps lower price, because the cost is spread over a greater number of similar items, when the quantities are large enough to be economically repeatable by appropriately contrived machine-tools working to predetermined size-tolerances in order that component parts shall be rendered capable of being assembled together with the minimum of inter-stage adjustment and labour.

Thus by processing on a sufficient scale some cost reduction may reasonably be expected, coupled with closer uniformity of product; provided, of course, that sales be augmented to a commensurate degree, unaided or possibly quickened by price adjustment, so as to enlarge the business turnover.

In these respects the company is fortunate in possessing a factory that is part of the G.E.C. group of works at North Wembley, sharing up-to-date machine shops which are accustomed to specialised work and enjoying the advantages of access to well-known research facilities. The factory has its own development department and drawing office surprising as it may seem, a single X-ray model has involved the production of as many as 700 separate drawings.



1. Assembly shop. 2. Transformer winding in progress. 3. Vacuum impregnating shop

The manufacture of any series of units is preceded by a complete working model which is subjected to extreme tests, all parts likely to show signs of wear being put through exacting life tests. Components subjected to mechanical stresses are for the most part given overload tests in accordance with normal engineering practice.

Constructive precision and standards of performance are maintained by testing to schedule in a separate section which is not subject to the jurisdiction of the works. This section is equipped to deal with all tests, not only according to standards established in the Development Department, but also those set by the British Standards Institution.

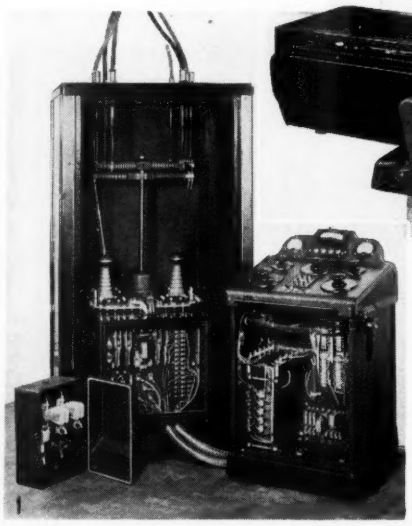
Separate sections have been provided to deal with the preparation of parts for enamelling and finishing, including grinding and degreasing. This type of product demands durable finishes of suitable colours and a properly equipped enamelling department has been established where synthetic stoving and other enamels can be applied with excellent results.

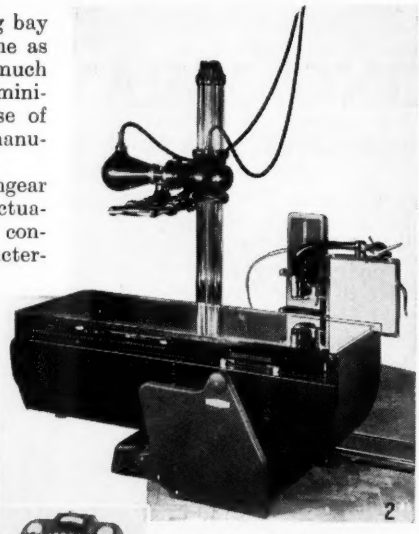
To facilitate after-sales servicing as well as for convenience when wiring up during assembly, most of the apparatus, such as control tables, &c., is wired in single and multi-core cables with special coverings of distinctive colourings according to a definite code.

A complete vacuum impregnating system has been installed for the treatment of transformer coils, &c., and facilities are available for oil, varnish and solid impregnation, together with the necessary pre-heating

and drying-out arrangements. The coil-winding bay deals with insulated conductors down to as fine as 1.5-thousandth of an inch in diameter, and much consideration is devoted to design in order to minimise size and weight, particularly in the case of some of the smaller shockproof equipments manufactured.

Ingeniously contrived contactors and switchgear are features of patented systems of remote actuation and automatic control for manipulative convenience and pre-adjustment of electrical characteristics, a good example being the "Röntgen IV" diagnostic X-ray apparatus. This is said to be the first high-power X-ray unit to be manufactured on a quantity basis in England; a batch of twenty-five of them awaiting despatch was considered to be a fair order for this class of diagnostic apparatus and to represent a scale of production not before attempted in this country.





1. The "Röntgen IV" apparatus, with remote automatic control table (right) and mains contactor box (left). 2. The "Autonome" tilting couch

This apparatus is designed to energise up to any one of four X-ray tubes, and the selection of any one of these four tubes, including the switching of the high-voltage supply from one to the other, is effected at the control table. In addition, all electrical factors are pre-set, so that the operator is able to reproduce results without the necessity of ever having to make trial exposures to determine that the electrical settings are correct.

The high-voltage unit comprises a high-voltage transformer, rectifying valves, valve-filament transformers and tube-filament transformers all oil-immersed in one common container, on top of which is a motor-driven high-voltage switch which selects the desired X-ray tube to be energised remotely from the control table, which is mounted on dual castors for mobility.

The apparatus is capable of an output of up to 40 kVA for fractional-second exposures, and is, therefore, capable of energising any type of X-ray tube from the lowest power up to that required for the highest power tube used in modern practice. The apparatus is arranged so that the tubes may be connected to it by means of shockproof cables suitably insulated for voltages up to 100 kV peak.

The "Röntgen IV" apparatus is provided with the necessary requirements for the electrical operation of accessory devices. One of the adjuncts is a tilting couch. The latest all-purpose "Autonome II" is motor driven quite silently and the tube underneath is totally enclosed in the base so that it can traverse the entire working length, while all controls are accessible from the operating side.

Of particular interest in certain respects, to which special significance may perhaps be attached, is the space-saving "Kingsway" dental outfit in the convenient form of a nicely poised extending wall bracket.

The rating of this apparatus is 10 mA at 60 kV, which is relatively high for a shockproof outfit of such modest size and weight. The tube-head serves also to house the filament and anode transformers, which are provided with both dry and oil insulation, the latter intended to act as a cooling medium.

This sort of combination is most attractive electrically, because such an assembly obviates any need for high-voltage cables, the attendant complications of which do not have to be stressed. A simple low-voltage connection to AC mains is all that is required to provide the input of 5 A at 230 V.

A section of the transformer assembly department and (right) the enamelling department

The original conception, and the motive which has been kept in the forefront throughout the design, is the production of high-voltage diagnostic apparatus suitable for requirements of large, and fairly large, establishments. Reliability has received particular attention, not only as it affects the generator, but also relative to the potential service-life of the X-ray tubes and cables.

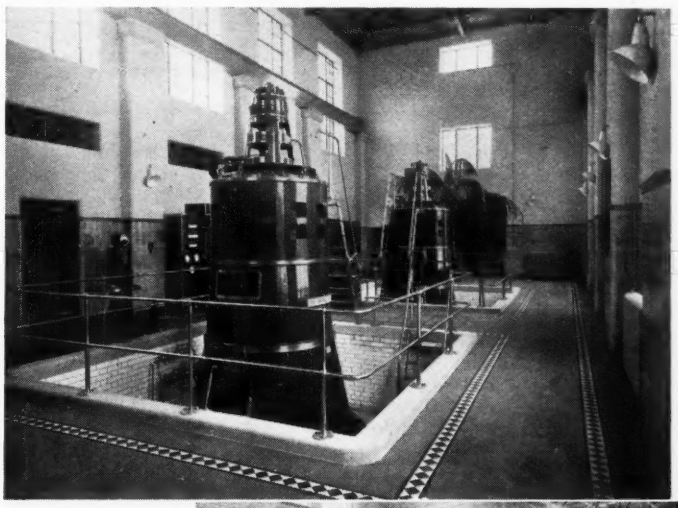
The fact that the equipment is made in England means, among other things, that the user will benefit from the unquestionable advantage of after-sales service from the actual manufacturer.

PUMPING METHODS

Survey of Modern Electrical Practice

By F. Johnstone Taylor

A FEATURE of pumping practice in the United States to-day is an almost wholesale scrapping of steam plants in waterworks and their replacement by electrically-operated centrifugal pumps, many of which exceed 1,000 HP and not a few reach 3,000 HP. From a large amount of data recently published the average cost of installation is as low as £17 per HP. Energy costs on an average just over ¼d. per kWh and 3,000 gal. of water can be pumped to an average head of 30-ft. for 1d. The lowness of the average head is due to many of the pumps being low-lift units handling river water on to the filter beds prior to its being pumped up into the service reservoirs.



For work like pumping with its more or less continuous operation synchronous motors present the advantages of favourable power factor and good efficiency. For a rating of more than about 500 HP at 750 RPM a salient-pole synchronous motor is more efficient than any induction motor with or without a phase advancer and gives lower running costs. Its extra capital cost is always justified where the operating hours are long. Modern machines of this class, designed to start against 1½, 2 and 2½ times full-load torque, have the usual three-phase starting winding brought out to slip rings on the rotor and a separate exciting winding, requiring a relatively low exciting current, arranged on salient poles below the starting winding.

It is claimed that the difference in the full-load losses of a 1,200-HP, 750-RPM, three-phase, 50-cycle machine of this class and one of the older type is 9 kW, representing an annual cost with energy at ¼d. per kWh of £75, which, capitalised at, say, 15 per cent., makes the machine worth £500 more than a synchronous-induction motor.

The synchronous machine is best suited to relatively large powers, or to conditions requiring a starting current not exceeding 150 per cent of full-load current. Wound-rotor induction motors are used for pump drives in many instances, and if during starting the valve on the pump discharge is closed the number of resistance steps is a minimum. In large stations where a number of relatively large motors are installed a combination of wound-rotor and synchronous types often makes for the highest all-round efficiency, especially in automatically controlled plants, the former being operated at full load while wound-rotor variable-speed motors take care of variations in demand.

The starting torque of normal single wound-rotor machines may be 100 to 130 per cent. of full-load torque. Direct-on-line starting is cheap but is usually impermissible for large motors in Great Britain, where public supply undertakings usually set a relatively low limit to the capacity of motors that may be started in this manner.

With a closed delivery valve a centrifugal pump runs up to speed under the best conditions, and with large units present practice lies in the direction of valves which close automatically on the shutting down of the pump and so prevent reversal of flow. They remain closed till the pump has run up to speed on starting, the pressure so created initiating the opening movement of the valve which must not be confused with the common reflux type.

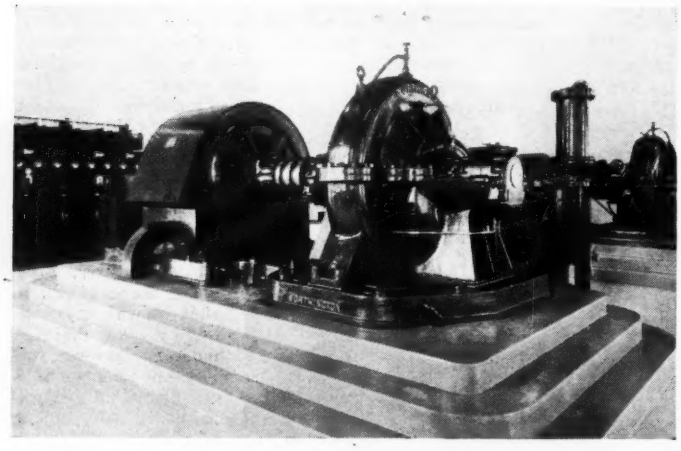
The double-wound rotor or high-torque squirrel-cage motor fulfils the need for a robust and simple machine that combines a comparatively high starting torque with a moderate starting current. With direct-on-line starting full-load torque can be obtained with a starting current up to 5½ times normal full-load value and lower figures with other methods. Slip-ring induction motors though more costly and having certain inherent disadvantages are suitable for starting up under overload conditions and can be built to start up against 250 per cent. of full-load torque.

Speed variation is not a normal requirement of waterworks duty because the job here is to fill a reservoir, after which the set is usually shut down automatically. In drainage pumping, however, variation of head has to be considered. A good example is the pumping station of the West Middlesex Joint Sewerage Board at Mogden, where the whole of the energy required is derived from gas produced in the process of the sludge digestion. Rates of flow up to twice the normal dry-weather value are dealt with by vertical-spindle pumps with the motors at ground level some 64 ft. above them, leaving the storm water pumps, which are gas-engine driven, to deal with any excess. Each of the electrically operated sets is automatically started and controlled in speed by float gear operated by the sewage level in the suction sump and by differential gearing operated by differences between the levels in the sump and the discharge culvert.

Top: Borehole pumps at Balsden, Brighton (Harland Engineering Co.)
Bottom: Typical modern waterworks pumping station, capacity 4½ million gallons per day (Worthington)

Actually the pumping lift varies between 34 ft. and 58½ ft., according to the levels of liquid in the high-level and low-level sewers. When started, each pump has a capacity of 2,000 gallons per minute which is increased to a maximum of 5,130 gallons by controlling the variable-speed motors through a speed range of 682 to 841 RPM. Thus the output can be varied quite smoothly between 2,000 gallons per minute with one pump running at low speed and 30,000 gallons with all six units working at maximum speed.

These pumps, like those at Torksey and Southampton, are centrifugal pumps of a more or less orthodox type operating on low lifts, though the ones at Southampton have turbine-bladed impellers to deal with the head variation. A centrifugal pump does not maintain a high efficiency over a wide range of head unless its speed is varied. The question therefore arises as to whether this condition shall be accepted or whether the pumps should be driven by variable-speed motors or whether pumps with a flatter efficiency curve should be selected. While variable-speed motors were chosen for the Mogden plant, at another recent sewage pumping station



Single-stage volute pump for 35 million gallons per day against 225 ft. head at a speed of 594 RPM driven by a 1,750 BHP slipring motor (Worthington)

operated by the West Kent Sewerage Board propeller pumps have been installed.

For dock pumping and land drainage work the intermittent nature of the duty calls for the simplest and cheapest machinery without paying too much regard to efficiency. Pumps of the propeller, screw, axial-flow and mixed-flow types—they differ in certain essentials although of the same genus—are not necessarily more (and may be less) costly than radial flow centrifugals of similar output. If a modified screw form of impeller is mounted in the end-suction volute casing associated with this class of centrifugal pump as used largely for sewage pumping, it is classified as a mixed-flow pump.

Axial-flow pumps of the Vickers-Gill type have been found to be well suited for constant-speed duty for condensers and have been installed at Tir John (Swansea) and Fulham generating stations, as well as at the West Kent sewage pumping station. One the other hand, for the Dutch polder drainage pumping station at Medemblik and for the condenser pumps at Kearsley power station, centrifugals with variable-speed motors are employed. The Kearsley pumps are of more or less orthodox design, but those for the drainage scheme, dealing with a very low and widely varying lift, are unique. Basically, they are radial-flow centrifugals operating under conditions which recent experience would indicate as most suitable for axial-flow pumps.

Scherbius Control System

In both instances Scherbius regulation is employed, which gives a speed regulation of anything up to a 2 to 1 ratio, by means of slip regulators. This method is claimed to give greater flexibility combined with efficiency than any other. With slip-ring motors some speed variation is obtainable in a simple manner, but there are appreciable losses at the lower speeds and with change-pole and cascade systems the additional apparatus required is not inconsiderable while in the Scherbius system it is relatively small.

The Scherbius system is well suited to the speed regulation of borehole pumps and is applied to a 250-HP motor with wound rotor at the Bourne Vale pumping station of the South Staffordshire waterworks, giving a speed range of 850/620 RPM. A slip regulator of the commutator type is driven by a small induction motor while direct coupled to the main motor is a small polyphase frequency changer to provide field excitation to the slip regulator, the speed being regulated by the movement of the brushes of the frequency changer.

Borehole pumping also seldom operates against a constant head owing to the draw down of the water in the bore and at many plants the drive is by variable-speed motors. At the Slitting Mill station of the South Staffordshire Co. the pumps are driven by 350-HP AC commutator motors with a speed range of 810-660. Each set deals with 1½ million gal. per day, but under different conditions; in one case the water level in the bore is 50 ft. below the pump house floor and the head on the force pump is 570 ft. and in the other case the water level is 200 ft. down and the head on the force pump is 560 ft., making a total of 760 ft. as against 620 ft.

In the case of three 700-GPM sets at the Blundell House pumping station of the Southport waterworks, each unit can operate either independently or in parallel with any other unit against a maximum total head of 479 ft. Three distinct operating conditions have to be met. The first is that of maximum head, when the speed is 1,005 RPM and the water level in the bore hole is 250 ft. below the pump-house floor level, the balance of head being surface head and friction. The power absorbed at the pump shaft is 135 BHP.

On the other hand, with two of the units working the water level in the borehole is only 160 ft. below floor level, the corresponding total head being 389 ft. When pumping at the rate of 1 million gal. per day the speed is reduced to 914 RPM and the power absorbed is 109 HP. At minimum demand, only one unit will be working and the water level will be 100 ft. below floor level, giving a total head of 329 ft. The speed then being reduced to 852 RPM the power absorbed is 92 HP, so that the operation of the plant as a whole is extremely flexible.

The Southport waterworks has a plant at Aughton also with two units operated by 95-HP variable-speed wound-rotor motors, the duty here being 700 gallons per minute with a 283-ft. total head at 960 RPM, with switchgear of the push-button operated contactor type for starting, stopping and speed control.

This class of motor undoubtedly serves quite well for this particular duty, though for the larger powers to be associated with drainage pumping Scherbius regulation is usually employed.

While waterworks plants with units of 1,000 HP are becoming quite common in the United States, the largest built for Britain or the Dominions up to the present hardly exceeds 700 HP. There is a unit of this capacity at the Lancashire Steel Co.'s Irlam works with a duty of 12,000 gallons per minute at 140 ft. head by Mather and Platt. It is driven by a six-pole open-type synchronous motor rated at 655 kVA and a somewhat similar set was built some years ago by this concern for the Calcutta waterworks with a capacity of 10,420 GPM operating at the same head. It is driven by a 580-HP motor and there is a set at Shanghai waterworks operated by a B.T.H. synchronous motor of 650 HP duplicating a similar pump driven by a Diesel engine.

The Contractors' Conference

AS we have already announced, the annual conference of the Electrical Contractors' Association is to be held at Brighton from June 28th to 30th. The Director and Secretary (Mr. L. C. Penwill) has now sent us a copy of the registration form and provisional programme. Although the latter is somewhat on the usual lines, there is to be a different arrangement for the middle day (June 29th). Instead of papers and discussions in the morning and afternoon there will be one paper of more than usual interest in the morning, while the afternoon will be free, to meet the general desire expressed at last year's conference.

The conference opens on Wednesday evening (June 28th) with the reception by the president (Mr. Walter Riggs) at the Grand Hotel, followed by dancing. On Thursday morning the Mayor of Brighton (Councillor J. Talbot Nanson) will welcome the delegates and Mr. Riggs will deliver his presidential address. The above-mentioned paper will then be presented. The Mayor will hold a reception on the same evening.

The annual general meeting will be held on Friday morning, and in the afternoon there will be a garden party on the East Lawn of the Royal Pavilion, at which the band of the 2nd Batt. of the Sussex Regiment will give a musical programme. The evening will be devoted to a smoking concert and dancing at the Grand Hotel.

The Brighton Corporation is to afford a number of special facilities to delegates. Mr. Penwill says that a cordial invitation to participate in the conference is extended to members and trade friends.

Kingston and Fylde Breakdowns

IN our review of the report by the Chief Engineering Inspector of the Electricity Commissioners into two failures of supply last week, we recorded that certain undertakings on the Fylde Coast and their staffs were exonerated from responsibility. It should be stated that Mr. Nimmo also placed on record that the accident at Kingston did not arise from any act on the part of the London and Home Counties Joint Electricity Authority or Kingston Corporation or any one of their employees.

ELECTRIC ARC WELDING

Recent Progress

By "Arclight"

DEVELOPMENTS in electric arc welding during the last twelve months are closely linked up with the progress now being made by the Institute of Welding. The Institute through its research organisation, which is now firmly established, has set up five principle committees and twelve sub-committees (in addition to the many research committees) to each of which has been allotted the investigation of a separate phase of the problems involved. There has not only been a very great extension in the application of welding, but there is also an increasing demand on the part of users for still wider application. These involve in many cases the solution of new problems, mechanical as well as metallurgical. The Universities of Birmingham, Bristol, Cambridge, Durham and Glasgow have all been enlisted in the work of research and investigation.

In co-operation with the Institution of Naval Architects, the Shipbuilders' Conference and the Institution of Engineers and Shipbuilders of Scotland, the Institute of Welding has built a special testing machine to carry out investigations under a committee representing all the interests concerned, including the Admiralty and the classification societies steelmakers, &c., "to ascertain the soundest, lightest and most economical methods of welded construction on the grounds of equivalent efficiency and strength for riveted bulkhead stiffeners, deck beams and girders, shell framing, &c., as laid down in existing rules and regulations." The results of these should enable new tables of scantlings for welded construction to be drawn up by the Board of Trade and classification societies, similar to those used for riveted construction.

Considering the particular applicability of welded construction to tankers on account of its inherent gas-, water- and oil-tightness, the advance in this country would appear to be slower than is warranted by the experience already gained in other countries. It is a matter for consideration whether the

Six-ton welding manipulator carrying gear case cover (Davy)

welding interests cannot increase confidence by co-operating with the shipbuilders and owners of oil tankers in particular, in arranging for tests on full-scale bulkheads as was done by the 1912 Bulkhead Committee to confirm, under water pressure, the behaviour of the bulkheads as indicated by the static tests which are being carried out by the Institute.

The results would form the basis of new tables by the Board of Trade and classification societies. With the co-operation of a shipbuilder, the Institute is investigating some tests on a welded bulkhead in a ship now being built.

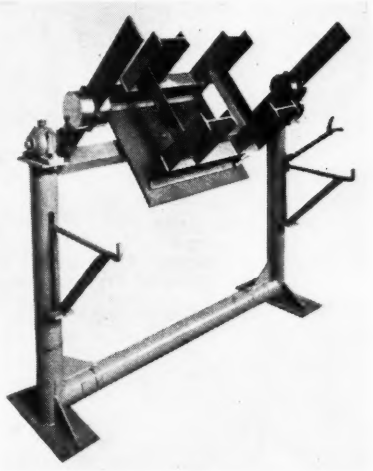
The naval authorities, both in this country and in America, have shown great interest and enterprise in the application of welding to shipbuilding. In naval shipbuilding the advantage of the reduction in weight obtainable is, if possible, of greater advantage than in mercantile shipping. The British Admiralty in particular has done and is doing everything possible to promote the application of welding, which has been free from any marked failures primarily because working methods have been carefully tested by experiment before being applied. Welding is now extensively used in warship construction in this country.

Within the last two years the use of electric arc welding has been greatly extended in the fabrication of heavy machinery. Not only has this newer application brought about the use of heavy currents and of larger gauge electrodes for fabricating mild-steel articles, but it has produced a welding manipulator for the handling of considerable tonnage.

Some elements of the cost of doing electric arc welding in the shop can be controlled, and for all practical purposes the rates paid for labour and for electrodes are the same to all manufacturers. It is, therefore, necessary for the management to search for lower welding costs, and this can be achieved in the handling of the job during the welding operation.

Power-driven equipment may be obtained which enables the operator to put the welding job in position without assistance of the overhead travelling crane, except to load the job on to the manipulator and take it off when finished. This type of manipulator will handle a wide variety of welding jobs. Manipulators cannot be built for universal application and special requirements may be met by the application of principles which engineers have demonstrated in floor level handling equipment for many years.

The United Engineering and Foundry Co., of Pittsburgh, were the pioneers of welding manipulators, their British licensees being the Davy & United Engineering Co., Ltd. These machines (illus.) can be made for dealing with work up to 30 tons weight. Their frames are built up of steel castings with rolled steel tie and baseplates welded together, the work-table and work-table base being steel castings. The work-table can be tilted to an angle of 90 deg. and can be rotated at any point, whether horizontal or vertical. Tilting is effected by an electric motor operating through spur and worm gearing and gear segments, and rotation by a further motor operating through spur and worm gearing and internal gear rim. Motors are push-button controlled.



Positioning machine (Lukenweld Corpn., U.S.A.)

The principal advantages of this type of equipment are lower costs, better penetration, reduced warpage, elimination of undercutting, and neat welds. In general, the desired result is obtained from a down-V weld (due to the combination of rotation and tilting) which permits the use of larger rods and more heat, giving better penetration. The warpage is reduced, as the welding procedure can be planned to distribute the heat, and sequence welding results on account of easily handling the work. Undercutting is entirely eliminated, as the rod is equidistant from both surfaces, and a weld having the proper contour results instead of a so-called quarter-round cross section, which is objectionable.

Welding costs are dependent upon the facilities for readily and easily placing all joints for down welding and for this reason welding manipulators of the larger capacities, and in most cases the smaller ones, have all motions power driven.

Positioning machines can also be used to advantage for handling parts of welding jobs and for turning them about so that the welds can be made in the gravity position. In some cases trunnions can be fitted to the ends of large jigs and supported in bearings so that the whole job can be rotated.

In the design of a heavy machine for welding, the machine must be regarded as an assembly of parts, and the procedure adopted for fabrication into a complete unit is developed as

follows: (1) The job is laid out in the template shop, the templates being made to the full size to which the steel will be cut. (2) The steel is then cut with the acetylene blowpipe. (3) After cutting to the required shape, those parts that need forming are bent by an hydraulic press. (4) The parts are then assembled together on well-aligned surface plates. The work is then assembled, tack-welded together, and inaccessible parts after full assembly are also completely welded. The tack welds must be strong enough to hold the component parts securely in place for the final welding. (5) All parts should then be checked for size and alignment, and then placed on to a positioner or manipulator to be welded up completely. (6) When the job is completely welded it should be braced at all places that might distort under heat and normalised in an annealing oven at 650 deg. C This normalising relieves the residual stresses that have been set up by rolling, bending and welding. (7) The job is then inspected and sand blasted, and followed by painting if required.

The principal advantages of utilising welding in the construction of large machine units may be summarised as follows: (1) No patterns are required, and where fresh designs are being made, a considerable loss of time is thus eliminated. (2) A lighter article is produced. Comparative figures from a number of different works show that the average saving in weight between a welded and a cast iron bedplate is approximately 15 per cent. for small bedplates, and up to 25 per cent. for large ones. (3) Rigidity can be obtained without having to add heavy masses of metal. The discreet use of gussets and stiffeners welded rigidly in the correct place will produce as rigid a structure as any casting can give with the minimum amount of metal. (4) The welded steel bedplate is very much less liable to damage than a cast iron bedplate. This is more particularly the case where the bedplate is for use with a portable plant or where it may have to be sent for considerable distances before erection.

Portable twin-operator AC welding transformer (Murex Welding Processes, Ltd.)

This comparatively new application of welding has brought about the use of heavy current plant and consequently large gauge electrodes for fabricating mild steel articles.

Substitute for Large Castings

Owing to the advent of rigid frames in constructional work more attempts are being made at replacing large castings by welding, and in view of this larger thicknesses of plate material are now being employed compared with a few years ago. The use of heavier sections entails the forming of larger welds, calling for a suitable combination of plant, electrodes and technique. In works where thick-plate welding of $\frac{3}{8}$ in. and over is carried out a welding plant of 500 A capacity should be used. The maximum output of 500 A is suggested, as the use of electrodes above $\frac{5}{16}$ in. diameter tends to become unduly laborious for hand operation.

A DC twin-operator plant, driven by electric motors for shop use and petrol or Diesel engines for field use, is recommended for high-speed welding, as well as the AC transformer. As different phases on a polyphase system cannot be paralleled, the primary winding of a two-operator set should be arranged for connection to single phase.

For high-speed welding, the principles involved in the Murex "Fastex 3" electrode, which is of the plain extruded type with a comparatively thin coating, are the shielding of the arc by an inert gas to prevent atmospheric oxidation and the deposition of a slag film to protect the deposited metal while cooling. The physical properties of the weld metal are approved by Lloyd's Register and the Board of Trade.

When welding fillets in the high-voltage position, a satisfactory weld can be made with one pass of the electrode with no weaving or side movement, providing the rate of forward travel of the electrode tip is properly controlled. The extremely fluid slag will float out to the surface without any manipulation.

The fillets produced will have a definitely reinforced throat, as is required by practically every specification for fillet welds. Once the surface is broken this slag can be removed with a wire brush.

All-Weld-Metal Tests

Where large fillets are required to be made downwards and the work placed at an angle of 45 deg., the finishing runs can be made either by weaving across the full width of the weld or by parallel knit runs without any weaving.

Physical properties of the weld metal are shown in the following test sheet made at the Constantine College in the presence of representatives from Lloyd's, the British Corporation, and the Board of Trade.

Number of piece	2	4
Diameter, in.	0.564	0.562
Area, sq. in.	0.25	0.25
Yield, tons	6.43	6.91
Yield, tons per sq. in.	25.72	27.64
Max., tons	7.76	7.85
Max., tons per sq. in.	31.04	31.40
Elongation on 4½ in.	5.31	5.34
Elongation percentage on 4½ in.	18.0	18.7
Elongation percentage on 2 in.	24.0	24.0
Diameter of break	0.485 in.	0.480 in.
Area, sq. in.	0.184	0.181
Reduction, per cent.	26.4	27.6
Broke	1⅜ in. from one end	Middle
Break	Silky, some small gas inclusions	Silky, some small gas inclusions
Izod's, 1	61.5, 89.0 and 84.0 ft.-lb.	
Izod's, 2	66.5, 61.0 and 78.5 ft.-lb.	

The all-weld-metal test piece was bent over 120 deg. round a bar, the diameter of which was twice that of the test piece, with no signs of fracture.

One of the difficulties experienced when welding with heavy currents is the heat generated at the point of contact of the electrode end in the electrode holder and also the considerable fatigue that results from the use of electrode holders with sufficiently large contacts to carry the heavy currents employed. To overcome this difficulty, a simple type of electrode holder has been produced, which consists of a piece of ½-in. diameter mild-steel rod, about 9 in. long and bent to an angle of 30 deg., about 1½ in. from one end; at the other end a wooden insulated handle is fitted with welding cable connection inside.

So far as is known, the largest piece of plant machinery ever built by welding process was recently constructed by the Morgan Engineering Co., of Pittsburgh. This machine is the largest and heaviest blooming-mill manipulator of its kind in the world, weighing 787½ tons. It is especially notable as having been completely welded electrically. Over 42,000 coated welding rods were used to make 16,000 ft. of welds, an average of about 10 rods per yd., giving more than 30 miles travel for the tips of the rods. The machine will handle ingots weighing 25,000 lb. at the rate of 40 an hour, and is used to pass big ingots back and forth through the blooming mill.

Japanese Power Project

A CORRESPONDENT in the Far East reports that a power plant of 300,000 kW is being constructed in Nagoya in two stages of 150,000 kW, by a company established in 1936 by an amalgamation of seven electric power concerns. Of the three units for developing 150,000 kW the first was completed in January last. It includes one 50,000-kW steam turbine, one 3,000-kW auxiliary turbine and three boilers, and further installations of two 50,000-kW steam turbines and three boilers. The whole equipment is expected to be finished so as to be ready for operation at the beginning of 1940.

The steam turbine is of the Mitsubishi Zoelly impulse double-cylinder, double-flow type, having a rated output of 50,000 kW at a steam pressure of 40 kg. per sq. cm., a steam temperature of 435 deg. C., vacuum 734 mm., and 1,800 RPM. The two condensers are to have a total of cooling surface of 6,000 sq. m. The main generator installed in the first unit, already completed, is to have a rated output of 62,500 kVA at a power factor of 80 per cent., voltage 13,200, and frequency 60 cycles.

The boilers are of the sectional water-tube type having a total heating area of 1,215 sq. m.; they are capable of evaporating 150,000 kg. of water per hour, and operate at a steam pressure of 45 kg. per sq. cm. For heating, pulverised coal is fired in the combustion chamber which has a total space of 980 cu. m. The boilers are equipped with superheater, fuel economiser and an air preheater.

ELECTRICITY AND INDIA

Import Possibilities

By Russell Potts, B.Sc. (Hons.)

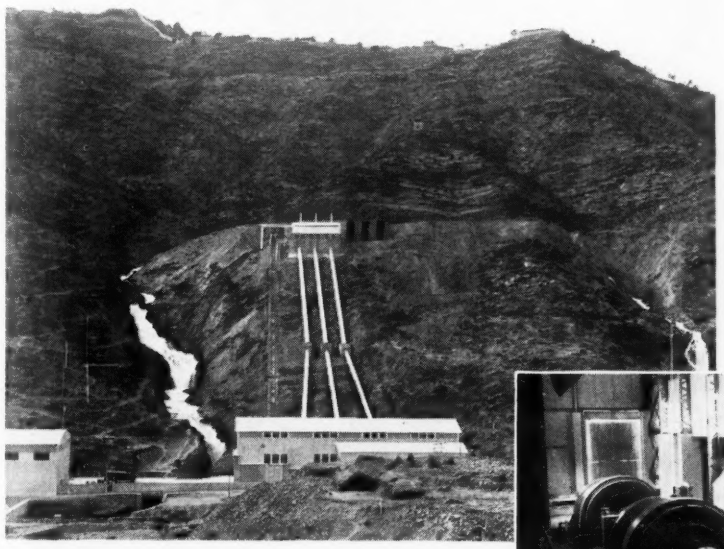
Editor, "Indian and Eastern Engineer"

In this further article in our export markets series the author surveys electrical development in India, points to the needs and suggests to British manufacturers methods of approach.

IN order to obtain a clear appreciation of the prospects in India during the next few years with regard to the demand for electrical goods, it is essential first to analyse the present make-up of the industry, trace its development in the past, and attempt to deduce the possible trend of future development generally, and in particular as regards certain schemes which are at the moment only in the embryonic state.

To those who have a clear picture of the industry in Great Britain with its closely studded towns, with populations often in excess of 100,000 and their quite appreciable domestic load, any attempt to draw a parallel with conditions in India will be futile. The average electrical consumption per head of population is 6 per cent. of the English figure, and with the domestic load averaging between 10 and 20 per cent. of the total it will be seen that, at the moment, particularly outside the cities of Bombay and Calcutta, domestic demand is ridiculously small.

Towns of 50,000 to 100,000 population have "power stations"



The Malakand hydro-electric development showing (right) the English Electric generating plant

of about 2,000 kW installed. Twenty-four-hour day supply is by no means the rule, and though the number of these stations makes them quite an important factor, let us turn first to the "meat" of the industry in India. Key industries are largely responsible for the situation and development of the major supply networks, and it may be opportune now to comment on these various schemes in detail.

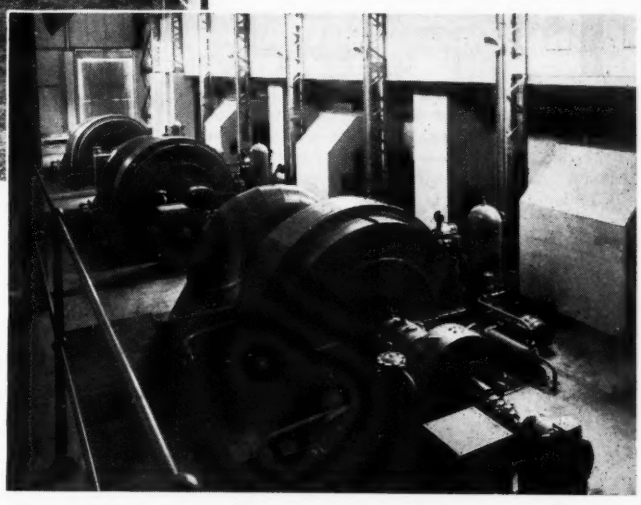
The Calcutta Electric Supply Corporation is by far the largest undertaking in the country and when its new power station nearing completion at Mulajore is put into commission it will have an installed plant capacity of 293,750 kW. A high-voltage network supplies the majority of the power required by the jute mills in Bengal, several engineering workshops and a multiplicity of sundry small industries which have sprung up in recent years in and around Calcutta.

In Bombay, the textile mills alone account for a demand of 90,000 kW from the Tata group. This group of three supply companies has a total installed hydro-electric plant of 183,000 kW, power being derived from the Bhore Ghat between Bombay and Poona. Tata's also give bulk supplies to the Bombay Electric Supply Company, the Bombay, Baroda and Central India Railway, the Great Indian Peninsula Railway, and several small undertakings in the locality. The G.I.P. also has its own 49,000-kW thermal station at Thakurli for supplying a portion of its main line load.

Turning from the two main cities of India with their specialised and concentrated loads we come to the Madras Government which owns and manages an extensive 110-kV grid network fed by Pykara in the west, Mettur to the north-east, and Papanasam (under construction) in the south. The Pykara plant has been extended within the last two years from 18,750 kW to 43,750 kW, and derives its power from a 3,000-ft. head of water. A further 1,000-ft. is available for future extensions giving an estimated increase of 30,000 kW. The Mettur project was put into commission last year and has an installed capacity of 37,500 kW with provision to raise this to 50,000 kW when the demand increases. The Papanasam scheme which was started last year is to have an initial capacity of 18,750 kW, increasing to 31,250 kW when required.

In 1938, the total energy sold by the Madras Government amounted to 136 million kWh and of this 80 per cent. was absorbed by the textile, cement and tea industries, and by tube-well irrigation. During the first three years of the scheme, the load increased tenfold. Now this increase has settled down to an average annual figure of 35 per cent., as compared with 11 per cent. in Great Britain.

To the north of Madras, the Indian State of Mysore has a 78-kV grid fed from the Sivasumudram hydro-electric station. The installed plant here amounts to 46,000 kW and construction work has already started on the Jog station (25,000 kW), and Shimsha station (17,200 kW). Jog is to be developed in four stages reaching a maximum of 100,000 kW capacity. In all, there will be 270 miles



of e.h.v. line with numerous transforming and sub-stations throughout the State. Of the present output in Mysore, 87 per cent. is absorbed by industry, a large proportion going to the goldfields while the remaining 13 per cent. is domestic load.

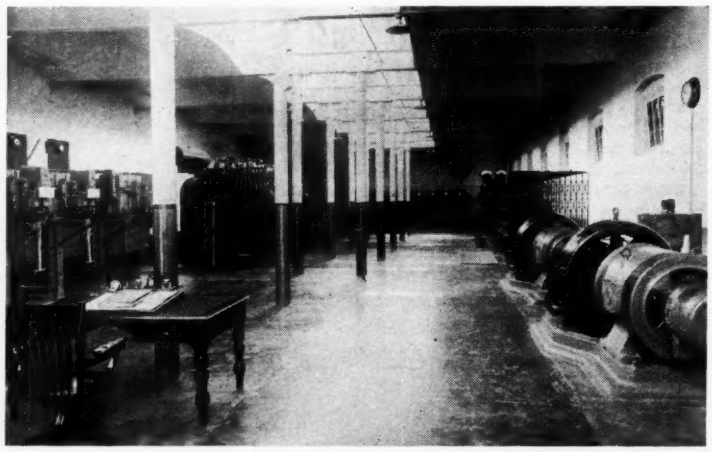
Leaving the south of India, we next come to the Upper Ganges Canal scheme in the United Provinces. Four of the ten low-head falls in this irrigation project have been harnessed, and 9,900 kW of plant installed feeding into a 37.5 kV network. Over 50 per cent. of the sugar factories in India are situated in this Province, and these provide a

considerable load, but a plan for extensive irrigation will necessitate an increase of electrical capacity to 28,000 kW.

In the Punjab, which lies adjacent to and north-west of the United Provinces, we find the only 132-kV grid in India. Equipped with plant identical to the British grid, this system is known generally as the Uhl River undertaking. The site was first discovered in 1922, a report prepared the following year and the scheme sanctioned in 1925. Briefly, the river at this point flows at a height of 6,000 ft. parallel to a secondary range of Himalayas beyond which the ground drops rapidly to the plains 4,000 ft. below. This secondary ridge has been tunnelled and a power station constructed at about 4,100 ft. above sea level.

The installed plant has a capacity of 48,000 kW, and comprises the first stage of the scheme. Later, two more generating stations will be built lower down the grade bringing the total capacity up to a maximum of 120,000 kW, when it will rank as one of the major schemes in the world.

A double circuit line, 173 miles long, connects the power house with Lahore, and there are a further 227 miles of branch lines. Last year the load had increased to such a degree that the Government is now considering the construction of the second stage which will increase the capacity to 70,600 kW, not including stand-by plant. An analysis of the load on this system indicates that rice and flour mills are the largest users followed by workshops, cotton and oil mills, and woodworking, in that order.



Sub-station in the Kardah large jute mills

Further to the north-west and right on the frontier a smaller but strategically very important system has just been commissioned at Malakand. The installed plant so far amounts to 9,600 kW, but provision has been made for extensions up to 19,200 kW. A double-circuit line feeds into a ring main, all at 66 kV, and the majority of the power is consumed by the various military cantonments which are situated in this area.

Apart from specialised generating stations such as the one supplying power almost solely to the Bihar coalfields, various plants privately owned by certain large iron and steel works, railway workshops, cement works, etc., and those municipal stations with plant varying between 250 kW and 2,500 kW, the foregoing reasonably well covers the power production side of the picture.

Possible extension schemes have also been dealt with, but when it is realised that out of an estimated total of 10 million horse-power latent in hydro-electric sites throughout India, only 5 per cent. has so far been tapped, one can readily visualise the future prospects which this country has to offer.

Electrical Manufacture and Imports

Turning to the electrical manufacturing industry in India, this is very largely confined at the present to cables, telephones (by the Indian Post Office), small fan motors and lamps, and it is problematical whether this list is ever likely to be extended to any marked degree. Industrialisation in the manufacture of heavy chemicals, cement, iron and steel, aluminium, and similar products has met with a very much more favourable support than those items in which individual design plays an important rôle.

As regards potential markets in the immediate future, on the generating side these will be confined largely to the "up to 2,000 kW" class required by new undertakings and for extensions to existing plant in old ones. To this class one might also add any self-contained industrial scheme which may be launched incorporating its own power plant. The major supply schemes, as has already been indicated, have quite an appreciable load to find before extensions, not already planned, are necessary.

It is in the supply of plant which will eventually absorb this available output that British manufacturers will find that the majority of their business will materialise. Motors, switchgear, transformers, power-factor improvers, rectifiers and a whole list of similar products could be enumerated as typical. The domestic load, too, should not be neglected, particularly refrigerators, irons, kettles and fans.

Actual import figures of electrical machinery during 1937-38 amounted to Rs.269 lakhs (Rs.1 lakh = £7,500) to which the United Kingdom contributed 61 per cent. as against Rs.246 lakhs in 1936-37 and Rs.192 lakhs in the previous year. The rate of duty paid on these imports amounted in most cases to 10 per cent., there being no preferential treatment in this class. Instruments, refrigerators and certain low-voltage, low-capacity switches, fuse boxes, etc., carry a slightly higher rate, but the reader is referred to the India Office, Whitehall, for definite details in respect of any particular product.

Advice to Manufacturers

Finally, a word of advice to those manufacturers who have so far had no experience of the Indian market but would like to see their products in this part of the world. Excluding those firms which are sufficiently large to warrant running their own organisations in India, almost the whole of the business done is through established houses who have branches throughout India, and who may be agents for as many as a hundred non-competitive lines.

They should get into touch with one of these firms through the British Trade Commissioner, who will be able to advise them on the possibilities and prospects for their products and suggest the most suitable agent. Having fixed up the agency if the potential volume of business warrants it, a trained technical man should be sent out, preferably one with selling ability, who can answer technical queries on the spot, tactfully handling complaints, and advise personally on the suitability of a particular product for a particular job.

India, to-day, offers more possibilities to the electrical manufacturer than probably any other part of the world; industrialisation has almost become a religion, and it is electricity which will supply the power.

It has been impossible in the space of this short article to give anything but a brief outline of the electrical industry in this country, its development, its prospects, potential markets, methods of doing business, tariffs, and the hundred and one other items which it is essential that every manufacturer trading with India should know. Many points are controversial in that they express a personal opinion, but if it has created an initial, or even revived an old, interest, the article has served its purpose.

World Power Conference

THE annual report of the World Power Conference, prepared by the central office at 36, Kingsway, London, W.C.2, recalls the meeting of the International Executive Council (which is the governing body) at Vienna last summer when 28 countries were represented; its next meeting will be at Zürich in July of this year. There are now 40 national committees, a new one having been formed in Algeria.

At the sectional meeting of the W.P.C. at Vienna last summer there was an attendance of over 1,000 from 37 countries and the British delegation, numbering 93, was nearly double the size of any other visiting delegation; 200 papers were presented. The second Chemical Engineering Congress of the W.P.C. is to be held in Berlin in 1940. The central office maintenance fund shows that contributions from national committees on account of 1938, including arrears for previous years, totalled £1,430.

Nine national committees made special non-recurring grants on account of 1938, totalling £145, and income exceeded expenditure by £366. This absorbed a deficit of £340, leaving a balance of £26 to be carried forward. Regular contributions during the past year fell short by £170 of the £1,600 required annually. Sales of Statistical Year Book No. 3 have considerably exceeded those of No. 2 during the comparable period after publication. The collection of data for No. 4 has commenced. It is an authoritative compilation on a comparative basis on solid, liquid and gaseous fuel resources, water power and the generation and distribution of electricity.

LOCAL LIGHTING

Is There a Good Case for It?

By W. Robinson

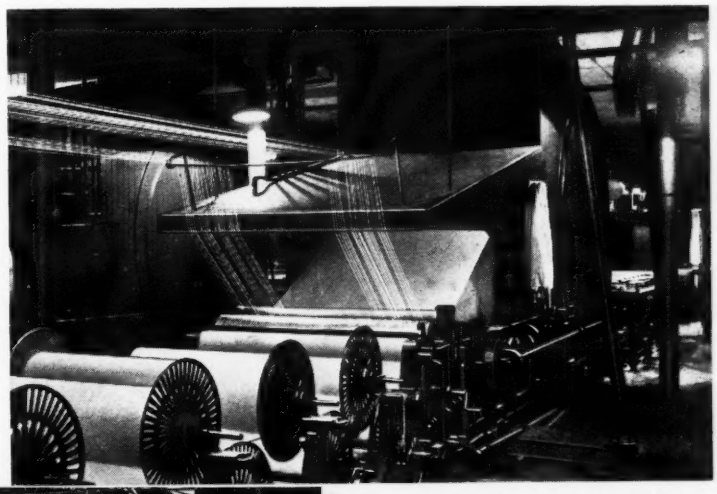
SO much interest is now being taken in artificial lighting generally that the time seems opportune for discussions of that most important aspect of industrial lighting, namely, local lighting. I have often expressed views on this subject and have met with divergences of opinion that seem to call for further discussion of a sort that will provoke comment. It should be understood, therefore, that the following remarks are expressions of opinion and are not necessarily scientifically proven, for real scientific analysis of the correct use of local lighting is yet to come, and is long overdue.

Lighting by individual sources, both in conception and fact, is a natural outcome of the substitution of one type of illuminant for another throughout the years of lighting inventions. Lighting is traditionally a matter of individual light sources, each covering a certain area, and its growth, from the rush and the wick lamp to the electric lamp of the present day, has been a question of obtaining higher and higher efficiencies from the sources.

It is not to be wondered at, therefore, that the individual lighting tradition is strong in factories, and stoutly upheld both by employers and employees. On analysis there does seem justification for the popularity of local lighting. It is economical and high intensities can be provided at the working point as and where required. But how does local lighting fit in with present day conceptions of illumination? Out of the dark days of pinpoint lighting we are struggling towards homogeneity of illumination, the treatment of a lighting scheme as a whole, the provision of uniform, glareless light of a measured standard of proved adequacy. This cannot be achieved by any system of local lighting and hence we can rule out local lighting for workshop illumination without danger of arousing controversy.

Where, then, are we to use local lighting? Obviously there are operations calling for its use, particularly special, non-repetitive jobs which may be carried out by only one man in a whole workshop and where it is manifestly uneconomic to provide high-intensity general lighting throughout the whole shop for the sake of this one man. Then, some individual lighting conforming to the conditions indicated later in this article is justified. In the case of tool-making departments just off a machine or fitting shop it is usual practice to allow the tool-makers local lighting to supplement the general shop lighting. This is by no means an ideal solution of the lighting problem and is very much behind contemporary lighting practice.

The only satisfactory lighting for this skilled and difficult work is high intensity general lighting and it is strongly recommended that works managers allow this type of small



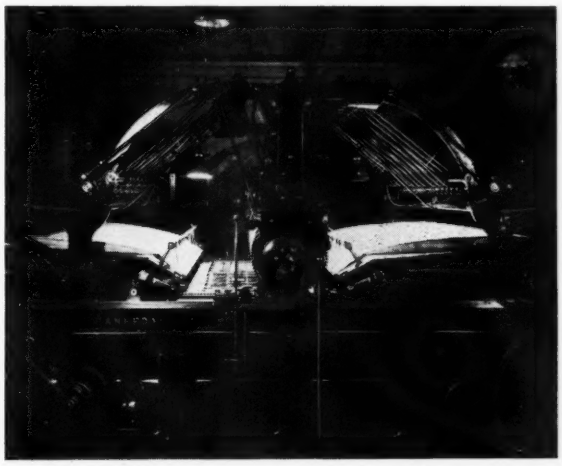
Correct use of local lighting. Note adequate general illumination supplemented by lamp under hood of slashing machine

Local lighting without brackets. Supplementary lighting assists good general illumination for roller backs and paint-mixing platforms in a tin printing works

department the privilege of possessing its own separate and suitable lighting scheme instead of relying entirely upon one form of general lighting which is, in many cases, wasteful as all devices are that do not properly fill their rôle.

There is much to be said, and particularly when a new factory is in contemplation, for the greater sectionalisation of workshops so that instead of uniform general lighting over an area housing many and diverse operations, we would have the overhead lighting carefully graded as to quantity and quality in accordance with the work to be carried out in each section. It will be evident that such sectionalisation is a natural tendency, small machines usually being grouped together, fine assembly being separate from large assembly, for instance, so that this principle need not be considered impracticable.

It must be admitted that much of the foregoing has indicated not means of local lighting but alternatives to local



Bad use of local lighting. Absence of general background illumination leads to undue contrast

lighting and the "cons" have rather ousted the "pros." I make no apologies for this, being firmly of the opinion that local lighting is too much an outcome of unsound ideas of thrift which take no account of the productive value of good lighting. However, it is admitted that local lighting has its uses and applications such as seeing into turned bores, inspecting small interiors, or interiors of complex machinery and many others.

The question is:—What form should it take? The mind immediately jumps to flexible arm brackets or low drop pendants. The former is certainly effective and eases many a difficult situation; the latter have nothing to commend them and the sooner they are abolished the better. Whatever form of local lighting is used, however, there are certain guides as to correct usage which do not seem to be sufficiently well known.

Dr. R. J. Lythgoe, in his treatise "The Measurement of Visual Acuity" indicates, although from a purely theoretical standpoint, one important consideration in local lighting, namely, the relation between the illumination on the work object and the background illumination. His researches revealed that maximum acuity of vision took place when the brightness of the surroundings was between one-half and equal to the brightness on the object worked upon when reckoned in equivalent foot-candles, *i.e.*, foot-candles reflected from the surface. Thus to fulfil these requirements surroundings of only 50 per cent. reflection factor would need to have an illumination on them of one to two times the illumination reflected from the work object.

The inference is, of course, that work on dark objects will benefit from suitable local lighting while light, or specular, surfaces must be treated very carefully in this respect. Since it is obviously not possible to go to the lengths of discriminating among the reflection factors of work objects, a ratio of 10 to 1 is now regarded as the maximum permissible contrast between the illumination on the working plane and that of the background or general lighting. Thus, however easy it may be to obtain a hundred foot-candles with a local fitting, the temptation should be sternly resisted unless general overhead lighting of at least 10 foot-candles is provided. This is an outside ratio and the smaller this ratio can be made the better both for employee and employer.

Modern lighting in a sewing room

Having regard to these conditions, and having proved a definite need, local lighting may be used with advantage; but having gone thus far, need we just stick a bracket in the way of work and hope that it won't be too obstructive? How many engineers have thought of using spotlights from above as a means of obtaining that extra kick of light? For many applications, one of which is illustrated herewith, this method excels, particularly for such things as calendering machines, printing presses and the like.

If brackets are insisted on, or, better still, built-in lighting, then low-voltage lighting should certainly be used. It is absolutely safe and, moreover, the lamps are more robust so that their life, under vibratory conditions, will be considerably longer and their efficiency higher.

I hope that I have put the case fairly for and against local lighting. There is an admitted bias toward general overhead lighting of higher intensities, but justification is claimed in that direct comparison between the two systems, for identical work, has always, in my experience, ended in the complete justification of uniform general lighting where previous local lighting was thought essential.

One of the illustrations shows such a system (with dispersive reflectors) which has been installed with complete success in a large sewing room where local lighting adherents claimed that it was absurd to attempt such work without individual machine lights. Prejudice has been routed in many other cases, and it should not prevent industrialists from getting the best out of lighting. After all, electrical illumination is very considerably cheaper even than in 1920, so is there any reason why out-of-date lighting notions should carry weight because they may offer the inducement of a spurious and ill-founded economy? Or is there any reason why, against their best interests, employers should defer to the opinions of their employees who know very little about artificial lighting.

I must conclude by confessing that this article is mostly "con" and very little "pro."

Science Museum Report

Reorganisation of Electrical Section

THE report for the year 1938 of the Advisory Council of the Science Museum (director: Col. E. E. B. Mackintosh) expresses profound concern at the Board of Education's apparently restrictive policy with regard to the Museum's future expansion.

The Council does not favour the suggested erection of loftier buildings of more than three floors on a smaller site. The rebuilding of the centre section, which was to have been completed by 1922, has not yet begun and portions of the east block, built in 1928, are still unfinished. Great improvement in the decoration and lighting of the older galleries has, however, been effected by the Office of Works.

In 1938 the Museum had 1,137,635 visitors, a decrease of 133,964, and 1,178 organised parties totalled 33,535 visitors: 618 public lectures were given to 18,714 persons, in addition to 198 special lectures to parties comprising 5,473 visitors. A 35-mm. sound-film projector has been installed in the lecture theatre and one of 16 mm. in the Children's Gallery.

During the year 1,174 acquisitions were accepted: 792 of them weer gifts, 132 loans and the remainder were purchased or constructed; 477 objects were disposed of or returned to their owners. The model-making workshop produced examples of fine craftsmanship, including a full-size replica of the Woolrich electro-magnetic generator of 1844. Working drawings have been produced of Edison's Peal Street power station of 1881 from information supplied by Babcock & Wilcox, the Deutsches Museum, Mr. G. Orrok of New York, and the Consolidated Edison Co.

The Electrical and Magnetic Instruments Section is much congested and its drastic reorganisation is in hand. The formation of an Electrical and Magnetic Phenomena Section is being considered; acquisitions include X-ray apparatus of 1896 and 1907. The Structure of Matter Section has secured on loan from Prof. E. O. Lawrence (University of California) an early example of the cyclotron and its display beside the original Cockcroft and Walton (Cambridge) apparatus affords comparison of rival methods of accelerating atoms. The original Wilson cloud-chamber is also now on view.

The Applied Chemistry Section now includes exhibits of the principles, applications and research methods of electrodeposition, including the electrodeposition of rubber. Additions have also been made to the Time Measurement Section and to the Electric Tramway Section. The Illumination Section has been reorganised and the Electric Power and Mining Sections are being similarly revised and the Radio Communication Section rearranged.

LOAD-ENERGY CURVE

By R. C. Golding, M.Sc.(Eng.), A.M.I.E.E.

WHILE the production of a load duration curve, as explained in a previous article*, places at the disposal of the operator much statistical data of importance, it possesses the disadvantage that in order to assess kWh an area must be measured.

The construction of a load energy curve overcomes this difficulty. Students of mechanics will recollect the procedure necessary to obtain a velocity-time graph from a distance-time graph, by plotting the slope of the distance-time graph, which is velocity, against time. Conversely, if the area beneath a velocity-time graph is plotted against time, a distance-time graph is obtained. In a similar manner, if the area beneath a load duration curve, which represents kWh, be plotted against load, a load energy curve results, together with various useful information.

Fig. 1 shows a load duration curve with load along the abscissa. Since the load never falls below the value x_1, then tx_1 units measured as an area are generated at 100 per cent. load factor. If the remainder of the area is then split up into strips δx in width, as between x_1 and x_2, a strip of load persisting for a time lying between t and t_1, then if the strips be small enough we can say that when the load lies between x_1 and x_2 the kWh generated are $(x_2-x_1)\left\{t_1+\frac{(t-t_1)}{(2)}\right\}$, or if we let t denote the average time of each strip $\int_o^t t\,dx$=total kWh generated.

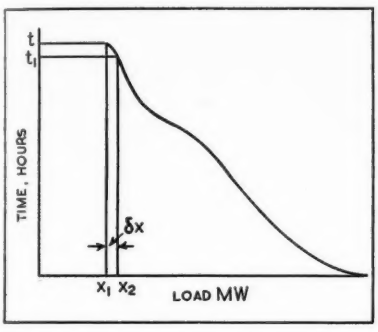


Fig. 1.—Load duration curve

Thus we can plot the area of the first strip against x_1, the the first and second strips together against x_2 *et seq.* Since, however, a curve in itself can only be regarded as approximate, a curve derived from a curve can only be less approximate, and it is necessary to use a mathematical method, which can be made to give results as close as desired.

This is obtained from a table similar to the summary sheet used for the load duration curve, as illustrated in the table. Columns 1 and 3 are transcribed directly from columns 2 and 5 of the summary sheet for the load duration curve. Column 2 shows the difference between the figures in column 1, and thus is the width of the load strips. By making these steps as small as necessary, any degree of accuracy can be obtained. Multiplication of columns 2 and 3 result in the kWh in each strip as in column 4, which are then summed to give the total generation.

In practice it has been found that if load groups of 2 per cent. of the total load are taken, the resulting kWh by this method are usually within 1 per cent. of the figure as metered.

Since the meters employed will probably not have an accuracy any greater than this there is no point in using smaller load groups.

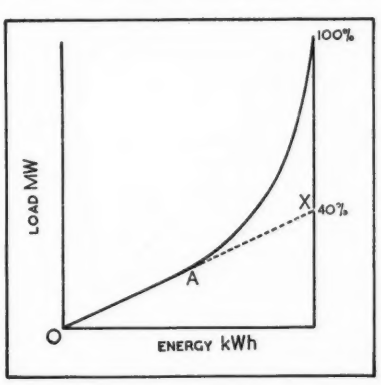


Fig. 2.—Load energy curve

Fig. 2 illustrates the final load energy curve obtained by plotting columns (1) and (5) from the table.

It has already been mentioned that the kWh in the first strip of the load duration curve are generated at 100 per cent. load factor. In the load energy curve this is represented by the slope of the line between the first point A and the origin. Thus, if the line OA be continued as shown, to meet the ordinate at X, then the point X represents the same number of units, but generated by plant all working at 100 per cent. load factor (A).

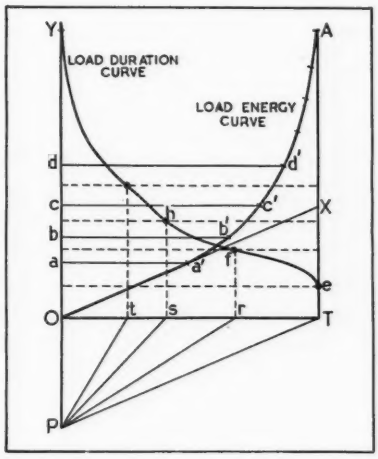


Fig. 3.—Construction of curves

Now load factor = kWh generated/m.d. generated × hours run = average load × hours/m.d. × hours.

Thus, since the ratio of average load to m.d. will give the load factor for the period, then if the ordinate is given a percentage load scale the reading at X thus obtained represents that proportion of the plant which could have generated the requisite number of kWh if fully loaded all the time. Thus the reading of (say) 40 per cent. on the ordinate is the load factor.

It will also be noticed that the load energy curve forms an arc between two tangents. This fact makes it more adaptable for the purposes of estimation, especially when the load factor is expected to alter.

① AVERAGE LOAD (MW)	② MW STEPS	③ CUMULATIVE HOURS REV.	④ GROUP kWh (+10⁶)	⑤ TOTAL kWh (+10⁶)
19·8	19·8	74·4	14·73	14·73
21·0	1·2	74·2	·89	15·62
23·0	2·0	73·7	1·47	17·09
ETC.				
85·0	2·0	57	·11	26·25
87·0	2·0	25	·05	26·30
88·4	1·4	5	·01	26·31

Commencing with a blank graph as in fig. 3 with ordinate and abscissa scaled in percentage figures, we draw in the line OX at the required angle to give the expected load factor. On this line the point a' is marked from an estimation of the expected minimum load, when with the assistance of a load energy curve for the corresponding past period the arc can be estimated very accurately.

To obtain the load duration curve from this curve, the procedure in the table can be reversed, or this can be done graphically. Let OA be the estimated load energy curve with a load factor TX, and mark this off into segments a', b', c', &c., such that each segment can be regarded as a straight line. Draw horizontal lines a', a, &c., back to the ordinate to form strips not necessarily of equal depth. Select a point P immediately below the origin, such that the distance $OP=TX$. Then draw PT.

Since $PO=TX$, PT will be parallel to 0 a'. Similarly draw lines through P parallel to all the segments on the load energy curve to meet the abscissa in r, s, t, &c. Then project upwards from each point including T to meet the mid lines of the corresponding strip giving the points e, f, h, &c. By joining these points we obtain the load duration curve TY. It is, of course, now necessary to rescale the ordinate in terms of load, and the abscissa in hours.

Institute of Wireless Technology

THE thirteenth annual general meeting of the Institute of Wireless Technology was held on April 28th at the Secretaries' Hall, London, W.1. The continued progress of the Institute was made manifest by the increase in applications for admission to membership. A satisfactory balance sheet was presented and the members expressed their appreciation of the financial and general position. The following officers were elected for the year 1939-1940 and it is interesting to note that Mr. S. A. Hurren was re-elected president and this will be his third year of office.

*ELECTRICAL REVIEW, May 5th (p. 643).

ATMOSPHERIC ELECTRICITY

By H. M. Sayers, M.I.E.E.

THE letter "A Static Phenomenon" published in the ELECTRICAL REVIEW of April 14th suggests that certain aspects of the electrical condition of the atmosphere, which have not recently been the subject of published systematic investigation, are not widely appreciated.

Benjamin Franklin in 1752 established the identity of atmospheric electricity with that known to be produced by friction. Several investigators found that an insulated conductor suspended in the air acquired an electric charge in relation to earth detectable by electroscopes (*i.e.*, of some hundreds of volts) at practically all times, but that the potential and polarity varied with the weather and other conditions.

The normal condition in "fair" weather is a potential gradient positive upward as if the earth were the negative plate of a charged condenser, the positive plate being either in the upper atmosphere or external to it. Sir William Thomson (Lord Kelvin) invented a portable electroscope and a water-dropping collector for measuring the potential of the air; he found a gradient of 430 V in 9 ft. in "ordinary fair weather" and as much per foot in breezes from the east and north-east. At Kew Meteorological Observatory (and some others) continuous records of the potential difference between earth and some air level showed that the usually positive gradient reversed to negative during "broken or rainy weather" (Fleeming Jenkin's "Electricity and Magnetism," fifth edition, 1880).

In 1841 a Mr. Andrew Crosse supported 1,000 yd. of wire about 60 ft. above the ground on six masts erected about 800 ft. above sea level. He devised insulators of glass rod protected by copper funnels against rain, and a terminal lead through a wooden panel replacing a pane of glass in the window of his experimental room. He provided a spark gap of about 3 in. to an earthing wire on the end support, as a lightning diverter.

In the room the wire terminated in a metal cylinder with a brass ball carried on a rod at one end. Opposite to this ball was another carried on a screwed stem passing through an earthed support, constituting a spark gap of adjustable length, thus clearly anticipating the spark-gap voltmeter. That was supplemented by pith ball and gold-leaf electroscopes.

He observed that in fine dry weather with no clouds overhead the electricity was invariably positive; the pith ball of the electrometer diverged about 1¼ in. about sunrise and sunset, dropping to about ¼ in. at midday and midnight. At the commencement of rain the polarity generally changed to negative; other changes seemed to be related to the weather, clouds passing, &c., but his view was that the main source of the electrification was evaporation.

Apart from thunderstorms the most impressive manifestation was during a driving fog when the insulators were streaming with moisture. Not for some hours did sparking start across the 1-in. gap, but it then became a continuous "stream of fire" that lasted for five hours, the polarity reversing from time to time.

During a thunderstorm a Leyden battery connected across a 1½-in. spark-gap was charged almost instantly, so that sparks discharges occurred at less than 1-sec. intervals. That gave him a gauge of the current passing. Thus, the battery could be charged in about four minutes by an 18-in. cylinder frictional machine, one hundred turns of which charged the battery sufficiently for the discharge to fuse completely more than 8 ft. of iron wire 1/240 in. in diameter; a full 4-min. charge fused 30 ft. of the wire. Therefore the display mentioned would have been sufficient to fuse 30 ft. of the wire per sec. Electrolysis of water and magnetisation of needles were also done with the discharge from the aerial.

Similar investigations were made by a Mr. W. H. Weekes who stretched 365 yd. of wire between two church towers. One of his terminal instruments was a water voltameter; the electrodes dipped only a part of the depth so that when the liquid level fell to their lower edge a spark passed between them and ignited the mixed gases. So the interval between the explosions was a measure of the ampere-minutes of the aerial discharges.

There is therefore nothing unusual in an insulated wire suspended a few tens of feet above the ground showing several hundred or even thousand volts to earth or sparking to earth. It would be unusual if such a wire failed to show considerable p.d. on an electrostatic voltmeter. I have seen sparks from an arc lighting circuit of overhead wire and from an ordinary "back-garden" wireless receiving aerial in a London suburb. Good insulation is necessary, because the current collected is small in calm weather; doubtless Mr. Crosse's "driving fog" carried charged water drops.

Nothing has been said here about the bearing upon the subject of the recent discoveries of the "Heaviside" and other layers in the high atmosphere and possibly of cosmic radiation.

The Contractors' Register

THE annual general meeting of the National Register of Electrical Installation Contractors was held last Friday, at the Institution of Electrical Engineers. The report of the Executive Committee presented by the chairman, Mr. P. V. Hunter, stated that while income had increased, expenditure had fallen, with the result that there was a surplus of £248 as compared with £9 for the previous year.

Ninety new certificates had been issued during the year as compared with 74 in 1937. During 1938 there had been 144 applications for registration of which 67 had been accepted, 16 declined and 3 withdrawn, 58 being still under investigation. The total number of applications received up to March 31st, 1939, was 3,618, at which date there were 1,745 on the Register.

A separate report on inspection of work stated that installations by 139 new applicants and 307 registered contractors were inspected. This involved examination of over 1,100 installations. Following inspection the names of two registered contractors were removed from the Register, one on account of bad workmanship and the other for refusal to comply with the undertaking given in respect of work. Eighty-six repeat inspections were carried out.

The Register's inspectors had continued to stress the importance of observing the I.E.E. Regulations and over 85 per cent. of the registered contractors had now voluntarily undertaken to comply with them without reservation. The question of wages paid by registered contractors had received close attention.

As a result of the operation of the Liaison Committee set up a closer co-operation had been established with the Electrical Contractors' Association. Further support for the Register had been obtained in Scotland by the work of the Scottish Committee. Applications for registration had been accepted or were under consideration from all the supply companies associated with Edmundson's Electricity Corporation, Ltd.

Referring to the financial side of the reports Mr. W. R. Rawlings, the hon. treasurer, said he was able to produce a much more satisfactory account than last year, as income from registration fees had increased since last year. Cost of inspections absorbed practically one-half of the total income and so long as the Register's income exceeded expenditure, then inspection was most desirable, as it was the mainstay of the Register and was appreciated by both the public and the industry, who were without doubt reaping a benefit of improvement of the standard of work throughout the country.

The report and accounts were adopted unanimously, and the nominations for membership of the Registration Board were confirmed. Retiring members of the Executive Committee Messrs. P. V. Hunter, A. H. Dykes and H. J. Cash were re-elected and Messrs. Hunter and Dykes were also re-elected chairman and vice-chairman respectively.

On the suggestion of Mr. L. C. Penwill, director and secretary of the Electrical Contractors' Association, consideration of two amendments to the rules and conditions of registration was deferred so as to give constituent members of the Association more time to discuss them. One of these proposed amendments is designed to permit County Councils and other local authorities having electrical contracting departments to apply for registration (the rules as they stand cover only local authorities operating their own electricity undertakings).

The other amendment would allow the Register to retain the whole of the registration fee of £5 5s. in the event of the refusal of an application for registration and would also abolish the issue of duplicate certificates. The meeting closed with a vote of thanks to the chairman, proposed by Mr. Rawlings.

PLUGS AND SOCKETS

From a Correspondent

BOTH Mr. Sills and Mr. Hudson in recent issues have come down heavily on the side of the round-pin plug as the appropriate standard. As there are numerous users of flat-pin plugs in this country it is only fair that their case should also be stated. The primary issue is not rigid standardisation as a theoretical objective, but service and convenience to the user, consistent with reasonable demands on the manufacturer.

The present position is that many people use flat-pin plugs because they have found that these give better interchangeability and adaptability than round-pin plugs. It is not so much a question of quality in manufacture as there are well-made plugs of both types; it is rather a matter of design and dimensions. Theoretically the flat-pin type is better than the round-pin, because the contacts are in line and the ends of the socket contacts open, and therefore only one dimension (*viz.*, thickness) need be looked after, whereas with the round-pin plugs the three pins are situated at the corners of a triangle, and there is difficulty in ensuring good contact.

The recent making of the round contacts springy and self-adjusting is an improvement, but this by no means provides a solution of the problem. The flat-pin method of retaining the thickness of the pin for contact and altering the width of control the entry or non-entry of a plug in a socket is so simple and advantageous that many engineers and users prefer it.

Theoretically, again, the design of a flat-pin contact lends itself to interchangeability far more easily because a smaller plug can be inserted into a larger socket outlet. A 15-A flat-pin socket will take separately and directly three sizes of plugs, *viz.*, 15, 5 and 2 A, which means greater facilities for using appliances—a point that is often ignored by advocates of round pins.

Although, of course, interchangeability can be obtained with the round-pin type by means of adaptors, this is merely an unsatisfactory expedient. An adaptor suggests that an appliance is not sufficient in itself, which is surely not desirable where standards are concerned. Adaptors are costly, cumbersome, inconvenient and often not available when required. They increase the watts loss, are liable to cause overloading of the cables and are not encouraged by the I.E.E. Regulations.

The principal argument advanced in favour of round pins is that there is a B.S.S. for them and that there are more of them in use. The argument might have weight if round-pin plugs were definitely superior to flat pin plugs, but advocates of round pins do not claim this. The practical question, therefore, becomes whether the advantages of a rigid standardisation of one type outweigh those obtained by disregarding the standard and choosing the other type. Many people are prepared to forego what they regard as the small advantage to be derived from the present standardisation for the sake of a type which gives greater convenience in service.

The advantages of standardisation can be over-emphasised. If a consumer has the same type of plug throughout his installation, he is not greatly concerned about its type, provided it is well-made to standard dimensions and he gets the maximum convenience from it. The only occasion when the matter does affect him is on removing from one premises to another, but even then the disadvantages are not so great as is sometimes suggested.

The most satisfactory solution to the problem would be a Standard Specification for both types that would ensure standard dimensions, just as both Whitworth and B.A. threads have been standardised.

Mr. Sills admits that a few years ago plugs of the flat-pin type were mechanically and electrically better than most round-pin types and that the advent of a first-class flat-pin plug some years ago was partly responsible for the advance in construction of the modern three-pin plug of the round-pin type. Nevertheless, he suggests that manufacturers of the round-pin plug should now be left in control of the whole field, although the flat-pin design is preferred by many thousands of users. A large proportion of existing round-pin plugs are not of the three-pin type and do not conform to the B.S.S.; many are of pre-1934 manufacture and are not interchangeable.

Mr. Sills takes it for granted that it has already been decided that the round-pin type shall be the standard for the country. There are only two authorities which have made any pronouncement on the matter—the B.S.I., which has prepared the specification for the round-pin type, and the I.E.E., which, in its Wiring Regulations, calls for compliance with B.S.S. 546, but there are other people concerned, *viz.*, the consumers who use the plugs and the supply authorities who have to inspect them before giving a supply.

There is no evidence that the demand for flat-pin plugs is decreasing in favour of the round-pin type or that supply authorities are setting their faces against the flat-pin type. On the contrary, the I.M.E.A. has recently decided to ask the B.S.I. to prepare a specification for the flat-pin type. This does not mean the introduction of "yet another non-standard plug," but the recognition of a type which on Mr. Sills's own admission has proved its merits and is now extensively used.

Improved Cinematograph Sound-head

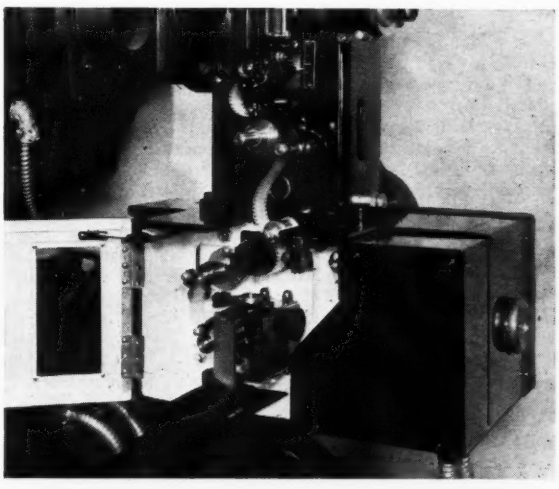
A PRIVATE demonstration of a new sound-head for talking film projectors, arranged at a West Kensington cinema last week by G.B. Equipments, Ltd., was preceded by a short tour of the machine-tool and assembly shops in which the equipment is made at the British Acoustic Works, Shepherds Bush, which have lately been enlarged and were being further added to at the time of our visit.

The essential difference between the new "Duosonic G.2" sound-head and previous models is that the latter employed a mechanical friction device and separate flywheel to damp out speed variations, whereas in the new sound-head the flywheel and reproducing drum assembly are combined and a liquid damping system is employed. The flywheel, a spun aluminium housing rigidly coupled to the reproducing drum, contains a liquid of high specific gravity and stable viscous properties over wide ranges of temperature. The aluminium housing freely rotates around the internal mass of fluid, but increasing speed, by centrifugal force, causes the liquid to revolve. Any high speed flutter is thus damped out by the reaction between housing and the heavy liquid; low speed variations are also rapidly damped out.

The enlarged image type of optical system includes a standard 32-W exciter lamp, projecting a magnified (7½ times) and easily visible sound-track image on a small screen surrounding the slit, affording a simple visual means of accurate focusing and mask adjustment. A feature not present in previous B.A. sound-heads is the use of two sprockets which isolate the bottom spool and take-up driving mechanism from the scanning point, and any irregularities due to the take-up or spools will not in any way affect reproduction.

The head amplifier and photo-cell are mounted on the sound-head, immediately behind the scanning bridge. Thus, there is an extremely short length of lead between the photo-cell and first stage valve, obviating any loss of high-frequency response and the need for resonant circuits within the main amplifying chain.

The driving motor is a detachable repulsion induction type housed in a rear compartment and runs at 2,880 RPM.



The "Duosonic G2" sound-head

Here and There

By "Nomad"

WHEN I was at Swansea a few days ago I had the opportunity of seeing a particularly good example of the advantages of utilising individual electric drive. For some years the Swansea Brickworks Co., Ltd., has been gradually changing over its plant from steam to electricity and is now in a position to appreciate the full benefits of the conversion. The company operates two works, one at Forest Fach and the other, the Copper Pit works, at Morriston. The plant at the former comprises five brick-making machines, while at Morriston there are three, including one double plant. Three grinding pans are provided at each works.

Apart from the general simplification of operation and control, Mr. Drake (the manager) told me, the use of individual drive had made a tremendous difference to output. Each of the works now produces somewhere about a quarter of a million bricks a week, about six thousand bricks being made each hour. Before the adoption of electricity the failure or adjustment of any of the pieces of equipment usually necessitated the shutting down of the whole plant, involving the complete cessation of output. Now, with every machine having its own separate motor, overhaul or adjustment is a simple matter and causes practically no dislocation of work.

* * *

So pleased, in fact, was the company with its experiments with electricity that it set to work to find a way to get rid of the only steam boiler remaining in the works, namely, a small vertical unit generating steam for heating the brick dies of the presses. As a result electrical elements have been designed for fitting to the plungers of the presses. These heat the dies in the same way as they were originally heated by steam, and Mr. Drake is completely satisfied with their performance. They cost only about a halfpenny an hour each for electricity, whereas the boiler used two or three tons of fuel a week, not to mention the labour costs and inconveniences. This use of electricity is new to me. Possibly other brickworks managers would be interested to know of it too.

* * *

When visiting buildings of any size it is very noticeable how much more care is taken with wiring arrangements than a few years ago. "Think of the future" now seems to be the almost universal watchword, and it is difficult to find a block of offices or flats, factory, etc.,in which the trunking, ducts and rising mains are not planned in such a way as to render any subsequent alterations or additions necessary to the electrical installation a straightforward and simple matter. This tendency is particularly noticeable in such places as hospitals and clinics, where electrical treatment is being employed for more and more purposes. In this connection one of the most "flexible" installations I have yet come across is that at the new Finsbury Health Centre, where both power and lighting points can be installed wherever required—almost at a moment's notice.

This makes one wonder whether the wiring of private houses is not somewhat lagging behind that of the larger buildings. By this, of course, I do not mean that the *standard* of wiring is lower but that by a little forethought and co-operation the builder and the electrical contractor might, without necessarily incurring any additional work or expense, save themselves or those who come after them a good deal of unnecessary trouble and expense.

* * *

Mr. F. M. Burrell, the engineer and manager of the Jersey Electricity Co., Ltd., to whose ingenious mistake-saving meter cards I referred a few weeks ago, has written to me on this subject. "One cannot help feeling," he says, "that it is high time provision for wiring was incorporated in the design of houses. Without going in for any elaborate scheme, a very considerable improvement could be made if only one floor board in every room was screwed down instead of nailed, and the joints under this were drilled so that wires could be drawn through without all the rough cutting away that goes on at present. If in addition to this a few ducts were left through the partition walls, it would be possible for the wiring contractor to make a much better job at a lower cost, as the labour costs would necessarily be considerably reduced where such facilities were provided."

* * *

The adoption of some such practice as this would appear to be commonsense and the cost would be negligible, but who cares? For many years to come, I am afraid, the provision of an additional plug point will necessitate a major operation on the home and that's a pity, for it is the insufficiency of plug points that is probably the most handicapping factor in domestic development to-day.

Correspondence

Every letter must be accompanied by the writer's name and address preferably, but not necessarily, for publication. The Editors cannot accept responsibility for correspondents' opinions

The Institution's Policy

I WAS interested in the article in the ELECTRICAL REVIEW for April 26th mainly on account of the emphasis laid on technical matters in the I.E.E. *Journal*. While the Institution is a technical body for the purpose of promoting the "general advancement of electrical science and engineering and their applications" and must necessarily devote the major portion of the *Journal* to the technical side, yet I quite agree that a widening of the scope would be very much appreciated by many members.

In spite of the high standard of our *Journal's* technical contents, we must recognise that many full members in the profession candidly state that they do no more than skim through its pages, whereas members of the A.I.E.E. admit that they find time to read the American journal because of the inclusion of well-informed articles bearing upon the management side which affects them in their daily life.

In addition to encouraging contributed articles to the *Journal* dealing with the subjects as suggested by your correspondent, there is also the proposal he puts forward in regard to examinations in management and administration. The inclusion of "Engineering Organisation, Management and Economics" in the graduateship examination as an optional subject some five years ago was certainly a step in the right direction, but the time has surely now come when this subject should be made compulsory for all those taking the graduateship examination.

As yet, comparatively few students appreciate the value of this subject as a means of using their technical knowledge to greater advantage. Even if the change were made it would affect only about 15 per cent. of those who eventually seek transfer or election to the associate membership of the Institution. Since those concerned have either graduated in engineering or science or have taken the higher national certificate with certain endorsements, it is assumed that the majority will have completed their studies by the time they are 22 years of age.

It would raise the general status of engineers and meet the criticisms raised by your correspondent if all such engineers were called upon to produce evidence of having at least studied successfully the fundamental principles of industrial administration by the time they have reached the minimum age of twenty-six.

This does not involve any hardship; on the contrary, it would give them a "peep" at the subject of administration and so remove one of the handicaps under which engineers are at the present time labouring.

There are now some seventy or more technical colleges in various parts of the country where teaching in administration and management can be obtained. In addition, there are various facilities for sponsored reading open to those who cannot attend technical colleges. The type of examination set by the Institution, the technical colleges, and the Institute of Industrial Administration is such that any engineer should have no difficulty in meeting these fundamental requirements.

An elementary introduction to the subject would enable men to perform their functions as junior engineers more efficiently, and, moreover, would encourage those who were administratively minded to follow up the subject as their responsibility in the engineering profession continued to increase.

E. S. BYNG.

London, W.C.2, *May 9th*.

Electric Razors in Bathrooms

I have noted the further remarks by Mr. T. C. Gilbert and "Shaver" which appeared in your issue of May 12th on the above subject.

Mr. Mills's statement, to my mind, was not at all difficult to follow, and if the washboilers are properly and permanently connected in the manner described by him they are absolutely safe and in accordance with the I.E.E. Regulations. Personally I am not in favour of ceiling switches with strings or chains dangling from the ceiling, and I prefer to use earthed switches in bathrooms.

Regarding "Shaver's" illustration which appears to show a combination 3-pin switch socket, I agree that that arrangement is quite good for bedrooms. I also agree with his remark: "With such a provision there is no excuse at all for using the razor in a bathroom."

A. MILNE.

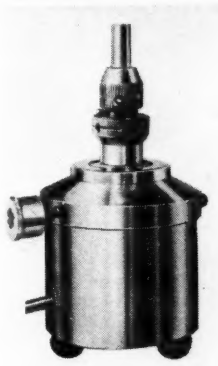
Glasgow, *May 12th*.

NEW ELECTRICAL PRODUCTS

A Review of Equipment Recently Marketed

A Garden Fountain

AN electric fountain brought out by STOKES APPLIANCES, LTD., 28-32, Chandos House, Buckingham Gate, London, S.W.1, for garden use is simply constructed, and as it works on a magnetic principle there are no rotary moving parts to wear or need greasing. The height of the spray can be regulated up to 8 ft., while the pond needs to be only 5 in. deep to enable the fountain to operate.



Stokes garden fountain

All models are soundly constructed and finished in chromium plate, and the loading is 6 W. Smaller sizes are available for indoor use with bowls, the bowl being drilled in the centre and the fountain bolted through with thick rubber washers.

A small aquarium model is supported by a tripod fitted with rubber feet to prevent slipping.

Rubber Bushes

The STANDARD INSULATOR CO., LTD., 75, Marylebone High Street, London, W.1, has produced a moulded rubber grummet, known as Series R.H.1004, for use as a cable bush in domestic cooker switches. It is claimed that this switch will fit tightly and accurately, and in most cases will fit the existing standard size holes in the switches, a considerable amount of pressure being required to remove them.

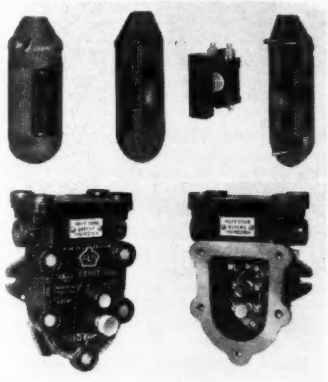
These grummets were originally manufactured for incorporation in ships' bulkheads, and they are therefore grease, oil, heat and paint resisting. They are also guaranteed not to split.

The series is designed, so far as size is concerned, for domestic switches only, but the makers can supply other types and sizes for use with switches of a size used in general engineering.

Industrial and Flame-proof Push-buttons

The range of push-button switches manufactured by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2, and Witton Engineering Works, Birmingham, has recently been extended by the introduction of new industrial and flameproof patterns.

Two types of emergency stop-button have been developed for industrial use with all classes of AC and DC machinery up to 500 V. The first type is suitable for mounting on a wall or switchboard or, if desired, on the side of the machine with which it is associated. The principal feature of this design is the size of the flap, which is made unusually large so as to be both conspicuous and easily operated in case of emergency. A locking device is provided on the button so that a machine having been shut down can be locked out by means of a padlock and cannot be started up again until the padlock has been removed.



G.E.C. push-buttons—Top: suspension industrial type dismantled to show construction. Below: Flame-proof two-way type

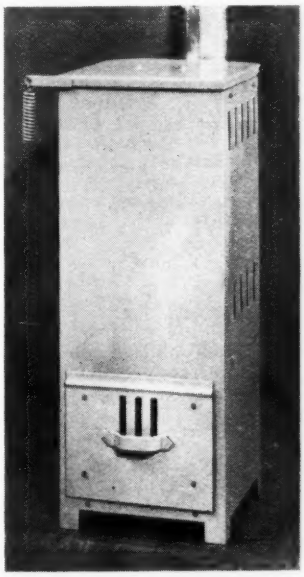
The control circuit is normally closed through the push-button and the operation of the flap serves to interrupt the circuit momentarily, and thus to shut down the machine on which it is installed. In the locked position the control circuit is held open until the flap is released by the removal of the padlock.

For machine tools, overhead cranes and similar applications the suspension type emergency stop-button shown in the illustration has been developed. The cylindrical case is of red moulded rubber with a ribbed non-slip surface, and the push-button movement is constructed of black bakelite and actuated by a flat plunger of toughened bakelite, which projects at one side as can be seen in the right-hand part top illustration which shows details of construction. Operation is effected by merely gripping the case, which is of such a size that the hand spans both case and plunger. The lead is a twin-core, t.r.s. flexible cable, entering through the top, a cable grip being provided to take any strain to which it may be subjected in service.

The G.E.C. has also developed two types of flameproof push-button for use in mines, gasworks, oil refineries or wherever an explosive atmosphere is encountered. These buttons are suitable for AC or DC service on inductive circuits up to 500 V, and they have been passed and certified by the testing station of the Mines Department at Buxton under Groups 1, 2 and 3.

The one-way type of push-button is intended for either starting or stopping, while the two-way pattern (illus.) is designed both for starting up and stopping. The push-button movement is constructed of moulded bakelite and is enclosed in a robust cast-iron housing, which is tested to a pressure of 120 lb. per sq. in.; machined flanges on both cover and housing ensure an explosion-proof joint.

A feature of the design is the provision of separate chambers for the accommodation of the terminals and the push-button movement, the connections between the two being suitably bushed so as to render each compartment independently flameproof. As a further safety measure the "stop" button is provided with a substantial mushroom head, while the "start" button is shielded; this ensures that in an emergency almost any kind of blow on the "stop" button will suffice to shut a machine down, yet it is practically impossible for it to be started up accidentally.



Bratt, Colbran incinerator

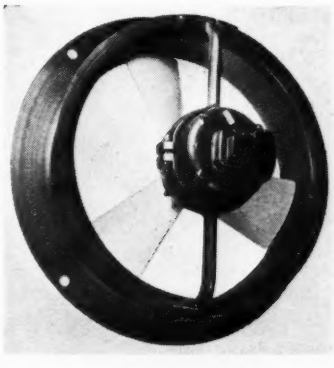
Electric Incinerator

A hygienic electric incinerator has been produced at a comparatively low price by BRATT, COLBRAN, LTD., 10, Mortimer Street, London, W.1, specially for places where women are employed. The loading is only 750 W and the size is 23 in. high by 8¾ in. deep by 8¾ in. wide, an attractive cream vitreous enamel finish being standard. The unit must be connected to a 3-in. flue, for which purpose a nozzle is provided.

Propeller Fans

The range of propeller fans made by DELCO-REMY & HYATT, LTD., 111, Grosvenor Road, London, S.W.1, until recently limited to sizes up to 12 in. diameter, has been extended to 15 in. and 18 in. sizes.

The larger models incorporate the features of the smaller sizes, namely silence and high efficiency obtained by the use of blades constructed on the latest aerodynamic principles, surrounded by a casing imposing minimum restriction on the passage of air entering the fan. Light weight is achieved by using a spun steel casing of rigid construction.



Delco 18-in. propeller fan

In the model illustrated, a terminal box is provided at the bottom of the motor supporting arm in such a position that the cable conduit can be screwed into the box close against the wall. The connections between the motor and the terminal box are brought down inside the hollow streamlined fixing arm. The total weights of these models complete with fan casing

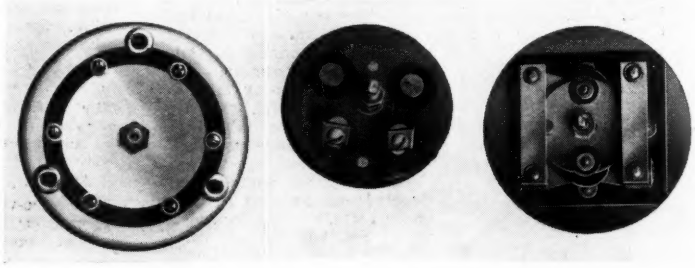
are 25, 31 and 35 lb. for the 12 in., 15 in., and 18 in. sizes, respectively.

In addition to standard air deliveries, special blades can be supplied for operation against water gauge resistances.

Thermostatic Devices

Two new types of thermostats have recently been developed by SALFORD ELECTRICAL INSTRUMENTS, LTD., Peel Works, Silk Street, Salford, 3.

One of these, a fire-alarm thermostat, works on the minimum rate of rise principle and is designed especially for installation in large buildings and warehouses. It is not responsive to ordinary changes in ambient temperature, but will react to rapid temperature changes of from 15 to 20 deg. F. per minute, responding in about one minute. It is normally set to respond to an ultimate temperature of 140 deg. F. as lower settings entail some risk of false alarms. The dimensions are 2½ in. by 1¼ in.

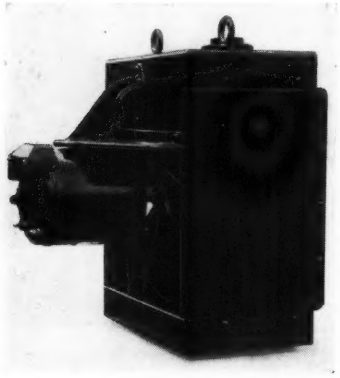


Salford fire alarm and thermo snap thermostats

The other new thermostat is a circular thermo snap switch which employs corrugated or plain bi-metal discs. It is designed for temperature ranges of from 90 deg. to 600 deg. F. with standard differentials of 10, 20 and 30 deg., and is supplied in both adjustable and non-adjustable types in ratings of up to 30 A, 250 V, AC; or 4 A, 250 V, DC. The overall size of these thermostats is 2¼ in. by ⅝ in. deep. Certain types can be supplied with heaters to decrease the differential and lag up to 50 per cent. The range has been specially designed for incorporation by manufacturers in flat irons, sterilisers, wash boilers, &c.

Motors for Ventilation

A recent addition to the Crompton "Minor" range of motors is a series of capacitor-start-and-run machines for fan and unit heater applications. Known as type "SR," the motors have a condenser permanently in circuit with both starting and running phases and consequently no centrifugal switch is required.



Crompton "SR" motor operating a fan

To avoid interference with the air stream by the external mounting of the condensers, the design incorporates the condenser in a special chamber opposite the driving end where it is totally enclosed by a removable cover. The chamber is separated from the motor windings and the working temperatures are well within the safe limits for the condenser design.

These motors are standardised as totally enclosed machines to exclude dirt and have a power factor of not less than 0.85. The range covers motors from 1/20 to ½ HP and speeds of 2,900, 1,440, 950 and 700 RPM. Either ball or "Marathon" sleeve bearings are available; "Marathon" bearing motors are particularly quiet, do not need lubricating for at least two years, and have special provision for fan end thrust.

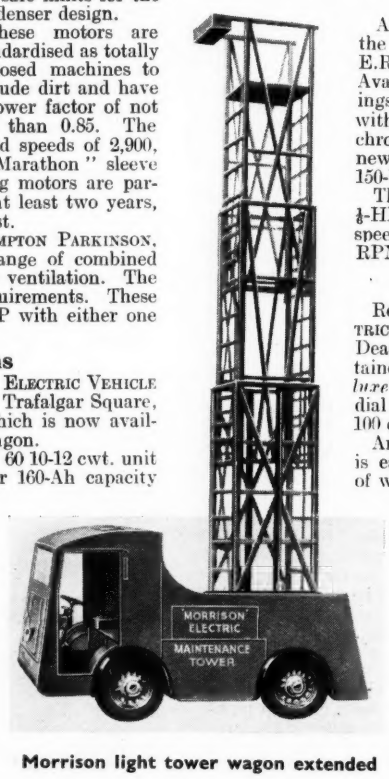
Another interesting development by CROMPTON PARKINSON, LTD., Bush House, London, W.C.2, is a range of combined motor and geared units for A.R.P. shelter ventilation. The hand gearing complies with H.M.O.W. requirements. These units are available in sizes from ¼ to ¾ BHP with either one or two handle gear drive.

Electric Tower Wagons

Details have been sent to us by ASSOCIATED ELECTRIC VEHICLE MANUFACTURERS, LTD., 231, Grand Buildings, Trafalgar Square, London, W.C.2., of a light tower wagon which is now available in addition to the company's heavy wagon.

The chassis employed is a Morrison type F. 60 10-12 cwt. unit which is obtainable with either a 120- or 160-Ah capacity battery suitable for 20- or 30-mile ranges, respectively, with 50 stops. The substantially built cab has an observation window in the roof and the body is built around the tower, cupboards being fitted on each side of the vehicle. There is a tool locker in front of the tower with a door at the side.

The tower is lightly constructed in three sections, being built of well-seasoned oak with the sliding parts steel plated. One man controls a small winch which brings it from the ground to full height—20 ft. 6 in.—in ten seconds. The finish is primer grey.



Morrison light tower wagon extended

Multi-purpose Mixer

A domestic mixer which can be put to a variety of uses is the "Merryway," supplied by L. G. HAWKINS & CO., LTD., 30-35, Drury Lane, London, W.C.2.

The standard equipment comprises a detachable mixer head, beater, whip and five-quart mixing bowl. Among the twenty accessories which can be connected are a coffee mill, colander, chopper and slicer.

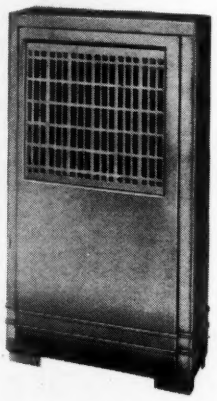
The unit is designed to stand on a table and the overall measurements are 15½ in. high by 7½ in. wide by 12 in. deep.

G.E.C. Convector

A convector introduced by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2, has special ducts in which the heating elements are arranged. These ducts have two purposes—they ensure that the body of the convector (with the exception of the grille) remains at a low temperature, and they also serve to direct the warm air outwards and upwards, providing an even distribution of heat throughout the room.

Except in the smallest size (the convector is available in ratings of 1,000, 1,500 and 2,000 W) the heat can be regulated very simply, the elements being arranged in two circuits and provided with two-heat control switches. The elements and electrical connections are inaccessible when the convector is in use, but may be very simply removed for servicing purposes.

The appearance of the convector has received particular attention, sprayed bronze being the standard finish used.



G.E.C. convector

New "Erco" Products

A low-priced reflector fire is one of the new "Erco" products made by the E.R. Co., 21, Park Road, Bromley, Kent. Available in both 700 and 1,000-W loadings, the unit is of neat, modern design, with die-cast side frames and adjustable chromium-plated brass reflectors. Another new line is an infra-red-ray lamp having a 150-W element operating at black heat.

The company is manufacturing a new ½-HP, single-phase, 50-cycle AC variable-speed motor running at either 1,400 or 2,800 RPM.

Runbaken Developments

Recent introductions by RUNBAKEN ELECTRICAL PRODUCTS, 13-15, Liverpool Road, Deansgate, Manchester, 3, include a self-contained portable ohmmeter. There is a *de luxe* model with an internally illuminated dial and dual range scale, calibrated from 0-100 ohms and 0-1,000 ohms.

Another new product is a spot welder which is easily portable. It is said to be capable of welding sheet metal of up to No. 18 gauge.

Portable Industrial Engine

A small petrol engine rated at 104 c.c. has been introduced by BRADBURY'S ENGINEERING WORKS, LTD., Norwich House, Southampton Place, London, W.C.1., for use with small generators. It is a four-stroke engine with flywheel magneto and splash feed lubrication.

The same base can be used for engine and generator or pump, and the unit weighs only 54 lb. The dimensions are 17½ in. high by 14 in. wide by 24 in. long.

Parliamentary News

(BY OUR SPECIAL REPORTER)

A Worcestershire Supply

IN the House of Commons on May 10th Mr. De la Bere asked the Minister of Transport whether he would draw the attention of the electric power company concerned to the absence of a supply of electricity in the village of Stoulton, Worcestershire, with a view to remedying this defect.

Captain Wallace said that the Electricity Commissioners had taken the matter up with the company concerned, which had intimated that, as a result of a survey of the village, it did not consider that the prospective demand was sufficient to justify an extension of its mains at the present time without some substantial guarantee of revenue, or contribution to the cost, by the consumers.

Supply in Rural Areas

Mr. De la Bere asked the Minister of Transport whether he would take steps in consultation with the electricity supply companies which were public utility companies to secure the necessary facilities to consumers and would-be consumers in the rural areas for a supply of electricity, since the Government legislation dealing with these matters had now been postponed for over a year.

Captain Wallace said that while in circumstances which his hon. friend would appreciate general legislation had had to be postponed, the Electricity Commissioners were always ready to investigate complaints of lack of facilities in rural areas which might be brought to their notice.

Mr. De la Bere asked what was arresting progress and if the Minister was aware that this took place long before the crisis and that some vested interests were deliberately obstructing it.

Capt. Wallace said he knew the hon. member was in the habit of receiving a lot of answers which he considered unsatisfactory. If he would go and see the chairman of the Electricity Commissioners, who would be very glad to see him, they might come to some understanding.

Mr. De la Bere asked whether the Minister was not aware that it was perfectly useless going to see these people unless the members of the House supported their fellow members and friends. Something must be done in this matter. It was the greatest scandal in the country.

Railway Carriage Lighting

Mr. Crowder asked the Minister of Transport if, taking the four chief railway systems, he could state in each case the proportion of passenger carriages still lighted by gas.

Captain Wallace said that excluding electrically operated stock, all of which was lighted by electricity, the number and proportion of railway passenger vehicles of all descriptions owned by each of the four amalgamated railway companies and lighted by gas was, at December 31st, 1938, as follows:—Southern Railway, nil; Great Western Railway (provisional figures), 1,083, or 18.14 per cent. of the total; London Midland and Scottish Railway, 709, or 4.22 per cent.; and London and North Eastern Railway, 2,781, or 22.68 per cent.

Radio Dealers and Television

On May 15th Mr. Kirby asked the Postmaster-General if he was aware that dealers in wireless sets and equipment in the North of England complained that they were suffering a serious restriction in trade, as compared to dealers in the London area, by means of the fact that they had no field for the sale of television sets and equipment as had dealers in the London area; and whether he had received from dealers in the North any representations on this subject, and what was the nature of his reply.

Sir W. Womersley, the Assistant Postmaster-General, said that he had received representations from various quarters concerning the desirability of extending the television service to provincial centres. There were alternative methods of extending the service, and their respective merits and costs were being actively investigated but no decision had yet been reached. The various interests which had made representations had been informed accordingly.

Radio Relays

Mr. Day asked the Postmaster-General whether he would now give particulars of the proposed charges to be made for the additional apparatus necessary to be used by telephone subscribers and its maintenance in cases where they desired to install the new broadcast relay service recently announced; and could he state when this service would be available to the public.

Sir W. Womersley said that preparations were being made as rapidly as possible for the provision of this service, but he was not yet in a position to announce the charges or the date of introduction.

London Transport Bill

The Bill promoted by the London Passenger Transport Board to extend its trolley-vehicle services, construct works, acquire land and raise additional money, has been sent to the Unopposed Bills Committee of the House of Commons, all opposition having been withdrawn.

In the Courts

Slander Action Fails

IN the King's Bench Division on May 12th Mr. Justice Greaves-Lord and a special jury had before them an action brought by Mr. Albert McKenzie, manufacturers' agent, Kennington, London, S.E., against the Mullard Wireless Service Co., Ltd., Mr. D. Harrison and Mr. A. W. Welton, both of Mullard House, Tottenham Court Road, W.C., to recover damages for alleged slander.

Mr. McKenzie's case was that the defendant Mr. Donald Harrison, who was the sales manager of the defendant company, and the other defendant Mr. Welton, chief accountant of the defendant company, had at certain dates in November and December, 1937, made statements to a Mr. A. E. Harris (a member of the firm of Harris & Russell, Ltd.) and before a Mr. P. Barwell, a clerk in the employ of the defendant company, which implied and alleged that the plaintiff had stolen or had sold Mullard valves which he knew had been stolen when he bought them. The plaintiff alleged that by reason of the statements of which he complained he had suffered injury and damage to his credit and calling.

The defence of all the defendants was a denial that the words set out in the statement of claim, or as alleged by the plaintiff, were ever spoken or published by any of the defendants of and concerning the plaintiff.

Mr. McKenzie conducted his case in person, and at the close of his case his Lordship told the jury that as there was no evidence tendered to show that the defendants ever published or authorised the publication of the alleged slander he thought that the only verdict they could possibly return was one for the defendants.

This the jury did, and his Lordship accordingly gave judgment for the defendants with costs.

Damages Claim Settled

A settlement has been intimated in an action by Mr. William A. Gillott, electrical engineer, Northcote, 2, Holmbrae Avenue, Uddington, against British National Electrics, Ltd., Newarthill, Lanarkshire, for payment of £3,000 as damages in respect of alleged breach of contract.

The plaintiff stated that in terms of a written contract between him and the company he was engaged as commercial and sales manager from July 27th, 1936, until May 31st, 1939, at a salary of £1,000 per annum. By a letter dated February 17th, 1938, the company, plaintiff said, dismissed him from its employment. He had endeavoured at all times to promote the company's interest and to follow its suggestions, recommendations and instructions.

He had got into touch with a large number of potential customers and, in particular, during the period between September 27th, 1937, and December 28th, 1937, while carrying on his other duties, he called upon a large number of potential customers of the company's products and, particularly, upon the majority of the electricity supply undertakings in Scotland. He averred that he had lost salary and commission amounting to £1,795, and had also incurred loss by removing his home to England.

The company maintained that Mr. Gillott had been instructed to get into touch with certain potential customers but had failed to do so, and that therefore his dismissal was justified.

Mr. Gillott has accepted a substantial sum in settlement of his claim.

Cutting Off Supply

During a prosecution at Rochdale on May 10th the Deputy Town Clerk dealt with the question whether the supply of electricity should be cut off is one for the Electricity Department alone, whether the amount due for current was paid or not.

The case was one in which a householder was summoned for hindering an officer of the Corporation from exercising the powers conferred by Section 24 of the Electric Lighting Act, 1882. Mr. C. Barratt, Deputy Town Clerk, explained that officers of the Electricity Department had a right to enter premises at any reasonable time to inspect meters and fittings, and if need be for the purpose of disconnecting the supply. Any person hindering an officer in his duty was liable to a penalty. The defendant, however, refused to grant an officer access to the meters and in a letter admitting this was so said he had been under the impression that there had been some mistake by the Department, as he had paid £1 off his account and had promised to pay the remainder on the following Monday.

Mr. Barratt emphasised that it was not for the defendant to decide whether or not the electricity supply should be disconnected, that was the Department's concern, whether the amount due had been paid or not. The Corporation did not wish to penalise the defendant in this instance, but rather to draw the provisions of the Act to the notice of the public.

The magistrates imposed a fine of 20s.

Winding-up Order

In the Companies Court on May 1st Mr. Justice Crossman made an order for the compulsory winding-up of the Electric Truck & Battery Co., Ltd., upon a creditor's petition.

PERSONAL AND SOCIAL

Information regarding new appointments and other matters of interest for this page are welcomed

THE directors of the British Thomson-Houston Co., Ltd., have presented **Mr. A. Clements,** assistant secretary of the company, with a gold watch and chain on completion of fifty years' service. Mr. Clements joined the company (then the Laing Wharton & Down Construction Syndicate, Ltd.), on the day of its registration, *viz.*, April 23rd, 1889. The name of the company was changed to its present style in 1896, and Mr. Clements was appointed assistant secretary in July, 1897. When he joined the company in 1889 it had about a dozen employees, and there are now 16,312.

Mr. W. R. Gledson, a director of J. Gledson & Co., Ltd., of Newcastle-on-Tyne, has been installed as president of the Electrical Wholesalers' Federation, and chairman of the Council. Mr. Gledson took his degree in electrical engineering at Armstrong College, Durham University. He is a captain in the Reserve of Officers (R.A.).

Mr. W. R. Gledson

The Manchester and Liverpool electrical trades held their annual challenge match on May 8th, at Delamere, Cheshire, when Liverpool won the golf trophy by fourteen matches to ten. A perfect day's golf under ideal weather conditions was enjoyed, and during the subsequent dinner the donor of the trophy, **Mr. J. H. Farthing,** presented it to the winning side. The same committee was re-elected to arrange the meeting for next year, and Mr. Farthing was re-elected chairman. Mr. B. T. Hawkins, borough electrical engineer of Wallasey, proposed a vote of thanks to Mr. Farthing for presenting the challenge trophy, and in responding the chairman mentioned that the E.I.B.A. had benefited to the extent of £4, each competitor having taken out a card for the Sir Montague Hughman challenge cup.

On May 1st, **Mr. J. Snow Huddleston,** M.I.E.E., celebrated his twenty-first anniversary with the Union Cable Co., Ltd., of which he is managing director. To commemorate the event, he was presented by the staff with a silver loving cup, suitably inscribed. The presentation was made by Mr. Johnstone, the works superintendent, who has the longest period of service with the company. At the same time, a gold bracelet was handed to Mr. Huddleston by Miss Robinson for presentation to Mrs. Huddleston. Mr. Johnstone spoke of the high regard and respect which all employees, both of the works and staff, felt for Mr. Huddleston, and Miss Robinson referred to the interest Mrs. Huddleston had always shown in the social activities and welfare of those engaged at the works. Mr. Huddleston thanked the staff for their kind thought, and spoke of the happiness and contentment which prevailed throughout the whole organisation.

Mr. W. C. Dawson, manager of the main showroom of the Wolverhampton Corporation Electricity Department, has been appointed showroom superintendent in the Ealing Corporation Electricity Department. He takes up his new duties on June 1st. Mr. Dawson served his apprenticeship in the installation section and electric motor shops of the Wolverhampton Electricity Department, and was for two years in charge of branch showrooms at Penn, Wolverhampton, before going to the main showrooms in 1935. He has lectured before the local branch of the E.A.W., and has also given a series of talks to domestic workers in connection with the E.A.W. diploma.

Mr. W. C. Dawson

R. A. Lister & Co., Ltd., announce that they have appointed **Mr. F. Hill,** M.I.Struct.E., as industrial service supervisor. In his new position Mr. Hill will be in control of the fifty Lister service engineers at present at work throughout the country. He has for the past thirty years been closely associated with the building, contracting and quarrying sides of the engineering industry.

I.E.E. Awards.—The Council of the Institution of Electrical Engineers has made the following award of premiums for papers read or published during the session 1938-39:—Institution Premium, to Dr. T. E. Allibone, Mr. F. E. Bancroft, and Mr. G. S. Innes, B.Sc.; Ayrton Premium, to Mr. F. W. Lawton; Fahie Premium, to Mr. K. L. Wood; John Hopkinson Premium, to Mr. N. F. T. Saunders, B.Sc.; Kelvin Premium, to Dr. L. Hartshorn and Mr. E. Rushton, B.Sc.; Paris Exhibition (1881) Premium, to Mr. R. Nelson; Webber Premium, to Mr. N. F. S. Hecht; Overseas Premium, to Mr. H. S. Hvistendahl, B.Sc.(Eng.); Extra Premiums, to Messrs. G. H. Fletcher and A. Tustin, M.Sc., Dr. W. Betteridge, B.Sc., and Mr. J. A. Laird, Mr. F. Brailsford, Wh.Sc., B.Sc.(Eng.), Messrs. J. Higham, M.Sc., and J. P. Wolfenden, M.Sc., Dr. K. L. Jensen, B.Sc.(Eng.); Wireless Section Premiums, to Messrs. L. W. Hayes and B. N. MacLarty, O.B.E. (Duddell Premium); Dr. J. D. McGee, M.Sc., and Dr. H. G. Lubszynski, Dr. R. L. Smith-Rose and Dr. H. G. Hopkins, B.Sc., Messrs. P. R. Coursey, B.Sc.(Eng.), and S. N. Ray, M.Sc., B.Sc.(Eng.); Meter and Instrument Section Premiums, to Dr. E. G. James, B.Sc., Messrs. G. R. Polgreen, B.Sc., and G. W. Warren, B.Sc. (Silvanus Thompson Premium), Dr. H. M. Barlow, Mr. D. C. Gall, Mr. G. F. Shotter; Transmission Section Premiums, to Dr. W. G. Radley and Mr. C. E. Richards (Sebastian de Ferranti Premium), Prof. W. J. John, B.Sc.(Eng.) and Dr. C. H. W. Clark, Messrs. E. W. W. Double, B.Sc., and W. D. Tuck, B.Sc., Messrs. T. R. Scott, B.Sc., and R. C. Mildner, M.Sc.(Eng.). The awards for papers read before the Students' Sections are to be announced later.

Mr. D. B. Williams, former manager of the Leicester depôt of Underwood (Electric), Ltd., has now moved to Birmingham, where he will control the Birmingham and Leicester branches. He received his technical education at the Leicester Technical College, and was a pupil in the Leicester Corporation Electricity Department. In 1927 he was appointed consumer's engineer to the Rugby Corporation and two years later joined Vactric, Ltd., as their Birmingham manager.

Mr. D. B. Williams

Mr. Geoffrey Lloyd, M.P., Secretary for Mines, announces that he has appointed **Prof. W. M. Thornton,** O.B.E., D.Sc., to be chairman of the Departmental Committee set up to review the general regulations governing the use of electricity at mines under the Coal Mines Act, 1911, *vice* the late Prof. W. Cramp, D.Sc.

The Paisley Corporation Electricity Committee has agreed that **Mr. J. M. Barbour** shall be appointed to take charge of the commercial side of the Electricity Department, and **Mr. J. R. Bisland** the engineering side, during the vacancy of the position of electrical engineer and manager.

Mr. F. A. Ellis, of the Yorkshire Electric Power Co., has been, appointed as deputy borough electrical engineer at Huddersfield. He will take up his duties in about a month's time.

Mr. H. T. Cort, A.M.I.E.E. (late contract and sales manager of the Brush Electrical Engineering Co., Ltd.), has been appointed by the Yorkshire Switchgear & Engineering Co., Ltd., as representative in the Midlands area. In view of the association between Yorkshire Switchgear & Engineering Co., Ltd., and Transformers & Welders, Ltd., Watford, Mr. Cort will take an active interest in the products of the two companies.

Mr. B. M. Burt, vice-president and chief engineer of Bepco Canada, Ltd., Montreal, is to make a business trip to England to make an inspection of the various electrical works constituting the Canadian company. Mr. Burt's itinerary includes the power transformer works at Edinburgh and Hayes and the distribution transformer factory at Wimbledon, as well as the motor factories at Guiseley, Willesden and Trafford Park. He will also visit the new switchgear short-circuit testing station at the Crompton Parkinson works, Chelmsford, and the switchgear, instrument and lamp factories.

Dr. F. A. Gaby, the hon. secretary for Canada of the Institution of Electrical Engineers, has tendered his resignation from that office because he is no longer connected with the electrical industry. Dr. Gaby was formerly chief engineer of the Hydro-Electric Power Commission of Ontario.

Sir Louis Sterling, managing director of Electric and Musical Industries, Ltd., has asked the board to relieve him from his duties as managing director, and the directors have agreed to do so. In a statement issued on Friday last, Sir Louis said that for the past seven and a half years as managing director of E.M.I., he had in effect been acting managing director of the Gramophone Co. The directors had decided to appoint a

separate managing director of the Gramophone Co., Ltd. As E.M.I., Ltd., was practically a holding company and did no manufacturing or trading, he felt that the usefulness of his activities would be gravely impaired. In the circumstances he felt compelled to tender his resignation. **Mr. Alfred Clark,** chairman of the company, has assumed the duties of managing director for the time being. **Mr. A. J. Denniss** has resigned his position of vice-chairman and managing director of Rudge-Whitworth, a subsidiary of E.M.I. He states that he is to pursue another line of activity in the engineering world.

Mr. J. E. Mitchell, B.Sc., A.M.I.E.E., formerly of Grimsby and latterly with the Lancashire Electric Power Co., has been appointed assistant electrical engineer to the City of Salisbury, Southern Rhodesia.

On May 10th a presentation of an antique corner cupboard was made to **Mr. J. E. Bradfield,** manager of the Order Department of W. T. Henley's Telegraph Works Co., Ltd., by members of his staff in recognition of his completion of forty years' service with the company. In making the presentation, Mr. J. W. Lapthorne, Mr. Bradfield's chief assistant, who himself recently completed forty years' service, referred to Mr. Bradfield's association with the social activities of the company and particularly mentioned his activities in connection with the foundation of the Henley Dramatic Club. Miss Williams presented Mr. Bradfield with a bouquet for Mrs. Bradfield. Mr. Bradfield entered Henley's service as a clerk in the Invoice Department in 1899, and after some time in the Costs and Contract Department was appointed chief of the Order Department in 1910.

At a dinner held in his honour, at the Queen's Hotel, Birmingham, on May 15th, **Mr. A. H. Wolseley,** managing director of Charles Clifford & Son, Ltd., was presented with a silver tea-service in commemoration of his sixtieth year in the non-ferrous industry. The presentation was made by Mr. H. W. Clarke on behalf of the Brass and Copper Tube Association, the Brass Wire Association, the Brazed Brass Tube Association, and the Cold Rolled Brass and Copper Association, and the individual members of these associations. Mr. Wolseley, during his sixty years in the non-ferrous trade, has taken an active and leading part in the industry and its associations.

Obituary

Mr. W. Frisby.—The death has occurred in London of Mr. William Frisby, M.I.E.E., former borough electrical engineer of Colchester. Mr. Frisby, who was sixty-six years of age, went to Colchester from Stockport in 1902 as chief electrical engineer, and was appointed borough electrical engineer in 1910, retiring in 1936.

Lt.-Col. T. L. Wenger.—The death is announced of Lt.-Col. Theodore Lanternier Wenger, M.C., A.M.I.E.E., which occurred on May 1st at the age of forty-nine, in Melbourne, Australia.

Mr. O. S. Hosgood.—The death occurred on May 2nd, at Cardiff, at the age of sixty-five, of Mr. Octavius Sidney Hosgood, who, from 1902 until his retirement in 1936 was superintendent engineer to the Cardiff Corporation Electricity Department, at Roath Power Station. Mr. Hosgood was a member of the Institution of Mechanical Engineers and an associate of the Institution of Electrical Engineers.

Wills.—Mr. H. J. Grewing, formerly director of the Oriental Telephone & Electric Co., Ltd., left £66,808, with net personalty £66,330.

Mr. J. J. H. Stansfield, secretary of the Yorkshire Electric Power Co., and a director of other electricity supply companies, left £9,086 (net personalty £7,688).

Electricity in a Brush Factory

ORIGINALLY water power was employed for generating electricity at the brush factory of W. H. Vowles & Sons, Ltd., Stonehouse, Glos. This plant is still available as a stand-by for certain other purposes. The main generating station, however, now contains a 125-kW gas-engine-driven alternator and main switchboard, the provision of which, together with a number of motors with appropriate control gear, was included in a contract placed with the General Electric Co., Ltd.

The alternator is driven by a Premier gas engine at 250 RPM and supplies a three-phase, 50-cycle, 440-V system, the gas being derived from sawdust and chippings produced in the brush manufacturing processes. The main switchboard is of the steel plate cubicle type with back access, and in front of it is a motor-generator set for changing the frequency. Its DC motor is of very early date; the AC machine is rated at 30 kW, 440 V, 1,000 RPM and converts the 50-cycle energy supplied to the stator to 100-cycle on the rotor. Power of the latter frequency is required for high-speed drill motors, spindle moulders, lathes, &c.

The saw mills cut round timber, largely local beech, into convenient lengths by means of a 72-in. reciprocating cross-cut saw driven by a 10-HP squirrel-cage motor. Subsequently, the timber is cut by a 72-in. rack saw and various circular saws into sizes convenient for shaping into the various brush parts, the motors being rated at 40, 25 and 20 HP at 1,440 RPM and controlled by auto-transformer starters.

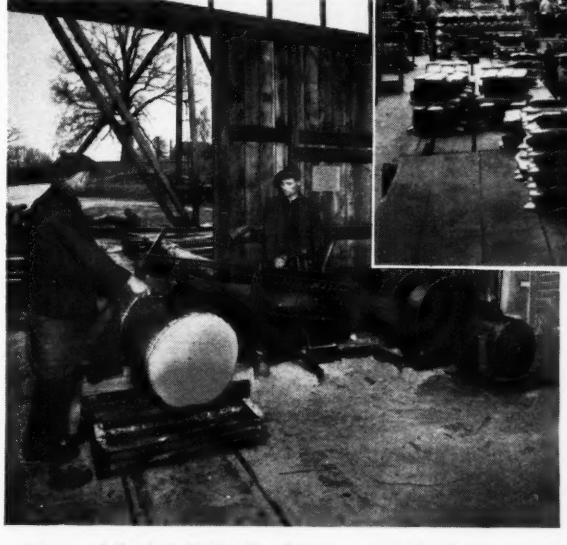
The shaping, turning and finishing of handles, backs and stocks for a variety of household brushes is done in an extensive workshop equipped with specialised individually driven woodworking machines, many of the tools having been built in the works.

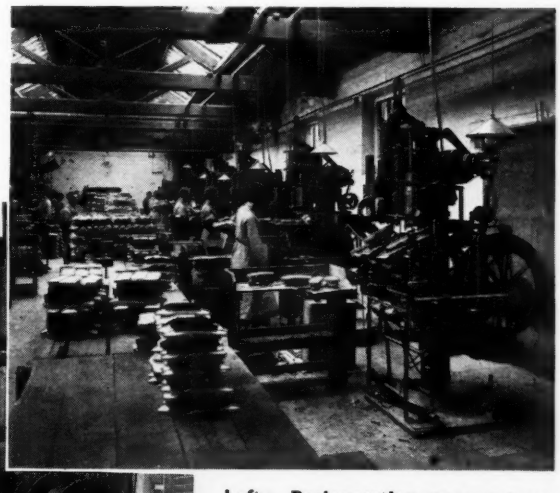
The brush back is first placed on a table, the motion of which is controlled to permit of the high-speed drilling of the holes to pattern, a process which is performed in amazingly rapid succession.

Subsequently the drilled back is passed to a table, and bristle or fibre is fed, picked up, and inserted in the holes. This operation is so rapid as to be bewildering to the onlooker. The drilling section of the machine is driven by a $\frac{3}{16}$-HP motor of 440 V and 100 cycles at 5,800 RPM, whereas the section of the machine which deals with filling is driven by a $\frac{1}{4}$-HP, 50-cycle motor at 1,400 RPM. Various finishing operations are then performed upon the brush.

The flow of the River Frome is still harnessed and provides from 25 to 35 kW for lighting, heating and a few power purposes. The hydro-electric equipment now consists primarily of two low-velocity turbines, suitably proportioned for changing power demands and volume of water, which transmit power by toothed and chain gearing to DC generators running at 730 and 960 RPM. These machines are each coupled to AC motors, one of 30 HP and one of 10 HP directly coupled to the main alternator.

Thus the 50-cycle supply governs the speed of the DC machines, boosting the power should the volume of water be insufficient to cover DC demands or, alternatively, absorbing surplus water power and transferring it to the AC system, when this is in excess of DC requirements.





Left: Reciprocating cross-cut saw driven by a 10-H.P. squirrel-cage motor. Above: Combined drilling and filling machines each driven by two motors

OVERSEAS ELECTRICAL TRADE

Decline of Exports During April

LAST month the value of electrical equipment exported from Great Britain amounted to £1,438,056. This figure is lower than for any month since February, 1937; in fact the £272,556 decrease recorded in comparison with April, 1938, is almost equal to the total value of imports which at £279,947 shows a very slight increase. For the first four months of the year exports at £6,952,265 were £287,258 lower than in the corresponding period of last year.

TABLE I.—EXPORTS AND IMPORTS DURING APRIL.

	Exports		Imports	
	April, 1939	Inc. or dec. compared with April, 1938	April, 1939	Inc. or dec. compared with April, 1938
Submarine telegraph and telephone cables	£12,408	+ £2,434	*	—
Telegraph and telephone wires and cables (not submarine)	85,556	+ 27,305	*	—
Other insulated wires and cables	209,002	— 43,964	£18,370	— £4,822
Radio receivers, not radiograms (excluding valves)	28,635	+ 2,097	14,196	+ 5,238
Radio transmitters (excluding valves)	29,978	— 39,586	*	—
Radio valves	34,608	+ 300	14,802	+ 5,362
Other radio parts and accessories	27,715	— 4,339	56,400	+ 12,623
Telegraph and telephone apparatus (other than radio)	181,150	— 33,325	*	—
Electric carbons	*	—	4,986	— 1,528
Incandescent lamps	42,872	— 7,758	6,000	— 2,903
Other lighting apparatus	48,554	— 870	26,119	— 2,453
Primary batteries	10,931	— 618	*	—
Accumulators‡	17,737	— 27,673	*	—
Electric cooking and heating apparatus	29,226	+ 697	*	—
House service meters	25,770	+ 6,567	*	—
Other electrical instruments (not telegraph or telephone)	20,606	— 7,339	27,061	— 848
Insulating materials not elsewhere specified	15,380	— 2,618	*	—
Unenumerated electrical goods and apparatus	102,577	+ 489	63,912	— 2,477
Electric generators up to 200 kW	36,261	— 10,117	*	—
Electric generators over 200 kW	103,659	+ 17,857	*	—
Electric motors	95,619	— 29,416	24,147†	— 2,800
Converting machinery	318	} — 45,811	*	—
Transformers for lighting, heating and power, including coils	66,478		*	—
Rectifiers for power-house use	5,138	— 2,049	*	—
Starting and controlling gear for motors	35,420	— 26,656	*	—
Switchgear and switchboards (not telegraph or telephone)	133,545	— 49,414	*	—
Other electrical machinery	11,728	+ 705	10,173	— 2,505
Electric vacuum cleaners	27,185	+ 546	13,781	— 1,965
Total	£1,438,056	— £272,556	£279,947	+ £922

* Not classified separately. † Not railway and tramway motors.
‡ Values not completely comparable.

The largest declines recorded in April were those relating to switchgear and switchboards (£49,414 dec.), transformers (£45,811 dec.) and insulated wires other than telegraph and telephone (£43,964 dec.). An analysis of the total for the last-mentioned item (£209,002) gives the following figures for destinations, the April, 1938, figures being given in parentheses:—

Rubber insulated wires and cables:—Australia, £23,005 (£30,661); South Africa, £22,276 (£21,171); British India, £17,659 (£15,240), New Zealand, £7,679 (£6,715); other British countries, £14,488 (£21,192); and foreign countries, £9,804 (£11,495).

Electric wires and cables, insulation other than rubber:—South Africa, £41,032 (£26,902); Australia, £19,529 (£35,016); British India, £16,832 (£29,095); other British countries, £23,809 (£31,190); and foreign, £12,889 (£24,289).

The next most important decreases were in radio transmitters (from £69,564 to £29,978) and telegraph and telephone apparatus, other than radio (from £214,475 to £118,150). The latter classification shows that while shipments to foreign countries increased from £62,401 to £69,582, those to British countries fell as follows:—South Africa, from £30,791 to £29,477; Australia, from £70,440 to £34,304; and other British countries, from £50,843 to £47,787.

Turning to the brighter side, we find increased purchases of £27,305 and £17,857 respectively of telegraph and telephone cables (not submarine) and electric generators over 200 kW, smaller improvements being recorded in the sales of house service meters (£6,567 inc.), submarine telegraph and telephone cables (£2,434 inc.); radio receivers (£2,097 inc.), other electrical machinery (£705 inc.), cooking and heating apparatus (£697 inc.), vacuum cleaners (£546 inc.), unenumerated electrical goods and apparatus (£489 inc.), and "other radio parts and accessories" (£300 inc.).

Balkan Countries' Purchases

Table II shows that Greece and Rumania made substantially increased purchases of goods and apparatus. Egypt and New Zealand are the only other countries which have augmented their purchases of this class of apparatus to any extent, while the countries most responsible for the £128,201 drop in the total are:—"Other foreign countries" (£60,661 less), Australia (£54,340 less), the Soviet Union (£20,622 less), and British India (£17,029 less). Australia has, however, offset to some extent her smaller purchases in this direction by buying £14,408 worth more "other electrical machinery," but the total under this heading is still £123,225 below the April, 1938, figure, "other foreign countries," Canada, British Malaya, British India and South Africa accounting for most of the decrease.

The Netherlands were largely responsible for an increase from £223,654 to £231,846 in the value of electrical goods and apparatus imported into Great Britain. The United States, too, had a larger share of the trade with a total of £75,996 (as against £65,606), while Switzerland and France with totals of £19,639 (£16,088) and £11,516 (£11,425) respectively also supplied more. Though Germany is still the second largest supplier, the total from this source shows a decline from £63,254 to £46,582. Belgium's share was £12,131 (£16,159), other foreign countries furnishing £14,917 (£17,967) worth and British countries £5,319 (£6,785).

TABLE II.—BRITISH ELECTRICAL EXPORTS DURING APRIL.

Destination	Goods and apparatus, April, 1939	Inc. or dec. compared with April, 1938	Electric generators, April, 1939	Inc. or dec. compared with April, 1938	Electric motors, April, 1939	Inc. or dec. compared with April, 1938	Electrical machinery, April, 1939	Inc. or dec. compared with April, 1938
Eire	£29,642	+ £6,594	*	—	*	—	*	—
Channel Islands	10,413	+ 3,224	*	—	*	—	*	—
Palestine	3,786	— 5,980	*	—	*	—	*	—
British West Africa	8,490	— 3,073	*	—	*	—	*	—
Union of South Africa	168,991	— 6,917	£34,600	+ £15,139	£13,494	— £12,831	£57,566	— £86,568
British India	96,006	— 17,029	15,485	+ 10,251	13,741	— 1,618	41,334	— 8,267
British Malaya	31,121	+ 4,515	*	—	*	—	3,648	— 8,847
Ceylon	8,775	+ 2,007	*	—	*	—	*	—
Hong Kong	10,644	— 842	*	—	*	—	*	—
Australia	135,049	— 54,340	12,641	+ 377	12,364	— 1,976	37,114	+ 14,408
New Zealand	87,721	+ 15,471	*	—	7,637	+ 2,182	17,620	+ 1,085
Canada	9,346	— 2,139	1,188	+ 411	3,449	— 817	3,873	— 10,139
Other British Countries	50,885	— 7,086	24,452	— 41,255	13,341	— 7,877	40,407	— 3,234
Soviet Union	2,167	— 20,622	*	—	*	—	*	—
Sweden	9,860	+ 3,073	*	—	*	—	*	—
Denmark	7,690	— 5,541	*	—	*	—	*	—
Netherlands	13,140	— 1,304	*	—	*	—	5,648	— 528
Belgium	8,611	— 1,210	*	—	*	—	*	—
France	16,137	— 1,522	*	—	*	—	2,116	+ 101
Portugal	2,458	— 5,947	*	—	*	—	*	—
Spain	1,056	+ 584	*	—	*	—	*	—
Italy	2,942	— 1,293	*	—	*	—	*	—
Greece	24,188	+ 17,202	*	—	*	—	*	—
Rumania	21,259	+ 13,426	*	—	*	—	*	—
Egypt	19,571	+ 10,783	*	—	*	—	1,039	+ 72
China	3,578	+ 1,231	*	—	*	—	1,872	+ 1,096
Brazil	3,124	— 6,403	*	—	*	—	*	—
Argentina	51,138	— 4,402	*	—	*	—	3,382	+ 1,690
Other Foreign Countries	84,917	— 60,661	51,554	+ 22,817	31,593	— 6,479	37,008	— 24,091
Total	£922,705	— £128,201	£139,920	+ £7,740	£95,619	— £29,416	£252,627	— £123,225

* Not classified separately. Vacuum cleaners are included in Table I but not in Table II.

COMMERCIAL AND INDUSTRIAL NEWS

Engineering Wages Increase. Electricity in Carpet Making. Eire Lamp Duty. Gateshead Electric Vehicle Exhibition. A Large Neon Installation.

Engineering Wages Agreement

AN agreement was reached on May 10th in London between the unions and the Engineering and Allied Employers' National Federation in settlement of the engineering unions' claims for wage increases to over a million workers. The agreement recommends the unions to accept an increase in the national bonus of 2s. per week for all male workers, and it is understood that it will apply equally to day and piece workers.

Sequel to Bomb Outrage

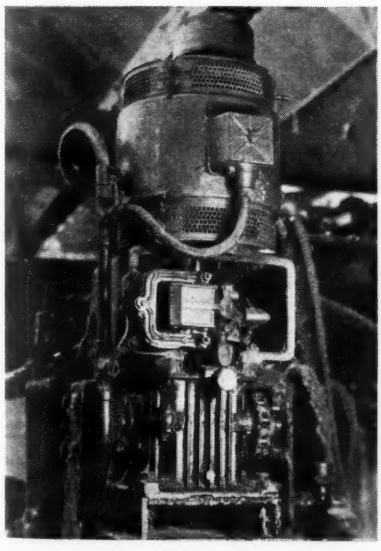
Warwickshire County Council has received a claim from the Central Electricity Board under the Riot (Damages) Act, 1886, for damages incurred as a result of certain bomb outrages to its tower on the Hams Hall-Bartley Green electricity transmission line near Birmingham. In this connection it is pointed out that although the Act provides, *inter alia*, that the police authority shall pay out of the police rate compensation for damages caused by riot, the term "police authority" has, since the Local Government Act, 1888, a special meaning in this respect in so far as it means the "county council." Although the claim of the Board (which has not been admitted on behalf of the Council) is comparatively small (£15) the possibility in the event of a recurrence of further outrages similar to those recently experienced in different parts of the country of a claim involving the payment of compensation on a large scale by the Council is viewed with much concern. It feels, therefore, that the responsibility of meeting such claims should be transferred from local authorities to the State and that the County Councils' Association should be asked to make representations to the Government accordingly.

Turbo-generator for West Midlands J.E.A.

The Brush Electrical Engineering Co., Ltd., has received an order from the West Midlands Joint Electricity Authority for a 30,000-kW Brush-Ljungstrom turbo-generator for installation at the Wolverhampton power station. The value of the order is approximately £110,000.

Electric Drive for Carpet-making Plant

The "Kar-Vel" carpet making plant at the works of John Crossley & Sons, Ltd., of Halifax, produces a novel floor covering which is used extensively by motor-car manufacturers. No actual weaving is employed in the process, the raw wool and hair which compose the pile of the fabric being directly vulcanised to the foundation by means of a rubber latex. With motors for the condensing sets, variable speed drives for feeding the wool, and the main pumping sets, over 100HP is used in the process, mainly consisting of surface-cooled motors made by Brook Motors, Ltd. The machine is operating on a continuous day and night basis, one of the most arduous duties being performed by the motor which drives the rubber spreading equipment. This Brook slipring motor is directly coupled to a "Radicon" gear. It reverses at full load output of 5HP fifteen times per minute, and has already made over ten million reversals. Control throughout is by Igranic contactor gear.



Reversing motor driving latex feed on "Kar-Vel" plant

Anglo-American Year Book

The 1939 edition of the Anglo-American Year Book which has just been issued (American Chamber of Commerce in London, Bush House, Aldwych, W.C., 10s. net) again contains all the information which those engaged in Anglo-American business will want to know. In addition to a review of the activities of the Chamber during 1938 and an alphabetical list of members with addresses there is a great deal of information on American institutions and law. There is also a commercial directory of American concerns with the names of British agencies.

Large Cable Drums

W. T. Henley's Telegraph Works Co., Ltd., has recently completed a large order for cable, and this was recently dispatched from the company's Gravesend works on two 38-ton drums, which are amongst the largest and heaviest ever handled. Each of the drums has a diameter of 12 ft. and an overall width of 7 ft. 6 in. Special spindles weighing over a ton each were made for each drum but owing to their length (11 ft. 3 in. by 6½ in.), they were too long to be inserted and transported with the drums. Our picture shows one of the drums leaving the company's works on the way to be loaded on to a barge on the Thames.

A large Henley cable drum leaving the company's works at Gravesend

Wick Electricity Employees' Wages

Wick Town Council at its last meeting rescinded a decision to increase the wages of electricity employees from 1s. 4d. to 1s. 7½d. an hour. Speaking on the financial position of the undertaking, the treasurer said that the Electricity Committee had steadily directed its efforts towards retaining ownership of the undertaking for the ratepayers. It might not be generally known how slender was the thread upon which that ownership hung.

Irish Duty on Lamps

The Eire Budget which was introduced in the Dail on May 10th makes provision for a duty of 75 per cent. on foreign electric filament lamps and 50 per cent. on Empire lamps excluding those which in the opinion of the Revenue Commissioners are designed, constructed and intended for use exclusively for scientific or for medical or surgical purposes.

French Domestic Appliances (Imports and Exports)

The appended table shows the French imports and exports of domestic electrical appliances during 1938 as compared with the preceding year. The French fr. values have been converted to sterling at 176¾ frs. to the £. As will be seen, both sections of the trade show a larger total, imports having advanced by £52,390 and exports by £54,880.

	1937	1938
Imports:	1,000 frs.	1,000 frs.
Electric fires and stoves	1·6,616	8,636
Electric irons	415	401
Electric vacuum cleaners, boot cleaners, etc.	5,306	4,861
Electrical refrigerators, etc.	15,598	23,117
Electric fans	723	903
Total frs.	28,658,000	37,918,000
Total at 176¾ frs. to £	£162,140	£214,530
Total Exports:		
All classes domestic elec. appliances in frs.	14,681,000	24,381,000
Total £	£83,060	£137,940

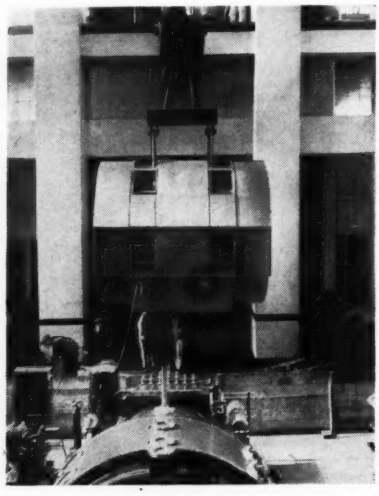
Works Visit

On May 10th thirty-nine members of the Huddersfield branch of the Electrical Association for Women visited

Siemens' Lamp Works at Preston. In course of the tour of the works they were shown tungsten and discharge lamps in all stages of manufacture. For this guides were provided by the general works manager, Mr. W. H. Le Marechal. After touring the works a short lecture was given by Mr. J. W. Aldington, chief works chemist, on fluorescent and ultra-violet lamps. The party was entertained to tea in the works canteen, and after Mr. Le Marechal had welcomed the ladies, a vote of thanks was proposed by Mrs. T. Herbert Kaye (chairman of the Branch) and seconded by Mrs. J. R. Dunkley (vice-chairman). After leaving the works, buses were chartered to Blackpool, where an enjoyable evening was spent. The visit was arranged in conjunction with Mr. C. Hughes, head of the Lamp Sales Department, and Mr. J. R. Hambler, of the Leeds branch.

A Large Stator

Work is now in progress on the installation of generating plant at the Dagenham Works of the Ford Motor Co., Ltd. The plant will include a 30,000-kW generator and our picture shows the stator being lowered in the power house. This weighs sixty-three tons and is among the largest in England. The new turbine is being installed by the British Thomson-Houston Co., Ltd.



Lowering a large stator into the power station of the Ford Motor Co., Ltd., Dagenham

Electric Vehicle Exhibition at Gateshead

Surprise that, of the 500,000 goods vehicles in this country, only 4,725 (less than one per cent.) were electrically driven was expressed by Sir John Maxwell, chairman of the Northern Traffic Commissioners, presiding at the inaugural luncheon in connection with an exhibition of electric vehicles at the Team Valley Estate, Gateshead, last week. The exhibition, which lasted two days, was organised by the Northern Counties Area Committee of the British Electrical Development Association and was the first of its kind held in the North-East. The exhibitors included the Metropolitan-Vickers Co., Ltd., Cleco Electrical Industries, Ltd., Partridge, Wilson & Co., Ltd., Electric Vans, Ltd., Associated Electrical Vehicle Manufacturers, Ltd., North-Eastern Electric Supply Co., Ltd., Chloride Electrical Storage Co., Ltd., D. P. Batteries, Ltd., Tudor Accumulator Co., Ltd., Westinghouse Brake and Signal Co., Ltd., and Messrs. Young.

Sir John Maxwell said that the electric vehicle had tremendous potentialities. If war came petrol supplies would be seriously curtailed, but they had electric power at their very doors.

Mr. F. C. Pette, general manager of the Middlesbrough Co-operative Society, who proposed "The Electric Vehicle Industry," expressed the hope that the exhibition would have its desired effect and extend the electric vehicle industry. His Society had been using electric vehicles for years and found they were simple to drive and clean. Running costs and wear and tear were less than with petrol vehicles. He concluded with the hope that the Government would assist the electric vehicle industry.

Mr. A. E. Bailey, manager of Provincial Laundries, Ltd., Newcastle-on-Tyne, who are users of electric vehicles, commented favourably on their performance. From inquiries he had made among the firm's vanmen, however, he had two complaints. Some sort of centralised lubrication was necessary, and drivers had complained that the vehicles were cold.

Major A. Trundle, chairman of the Electric Vehicle Association of Great Britain, Ltd., spoke of the electric vehicle's suitability for short delivery rounds. Mr. P. Dobson, of Darlington, proposed "The Speakers," and Lt.-Col. S. E. Monkhouse, managing director of the North-Eastern Electric Supply Co., Ltd., and vice-president of the E.D.A., proposed "The Chairman."

Registered Electrical Contractors

At the last meeting of the Executive Committee of the National Register of Electrical Installation Contractors the following applications for registration were accepted:—W. Parker (trading as William Haslam,) Derby; Iverson Electrical, Ltd., 312, Kilburn High Road, Kilburn, London, N.W.6; Folkestone Electricity Supply Co., Ltd.; F. Horsfield & Co., Ltd., 16, St. Anne's Court, Wardour Street, Oxford Street, London, W.1; and Electrical Engineers, Ltd., 18, Endell Street, London, W.C.2. At the same meeting one application was withdrawn.

Trade Announcements

Belling & Lee, Ltd., inform us that they have been accepted by the British Standards Institution as an approved testing authority under the radio interference-free marking scheme.

The British Aluminium Co., Ltd., has opened a branch office and warehouse at Abbey Buildings, Middle Abbey Street, Dublin (telephone: Dublin 22966), under the management of Mr. D. E. Catterell.

MacGregor & McCullum, Ltd., 1, Newman Street, London, W.1, have been appointed sole concessionaires for the British Isles for the Armstrong "Porta-lectric" table ironer for voltage ranges of 200/220 and 230/250 AC. First stocks will be available by the end of the current month, and the company is marketing the machine in conjunction with its associated company, the Ace Electric Co., of Huddersfield, which will look after sales in the northern half of England. The British Electrical and Manufacturing Co., Ltd., 187, St. Vincent Street, Glasgow, will be the company's sole agents for Scotland.

Londex, Ltd., is removing this week to Anerley Works, 207, Anerley Road, London, S.E.20 (telephone: Sydenham 6258-9. Telegrams: Londex, Southnor, London).

From Monday next the new address of Philips Lamps, Ltd., will be Century House, Shaftesbury Avenue, London, W.C.2. The telephone number remains unchanged.

The Home Market

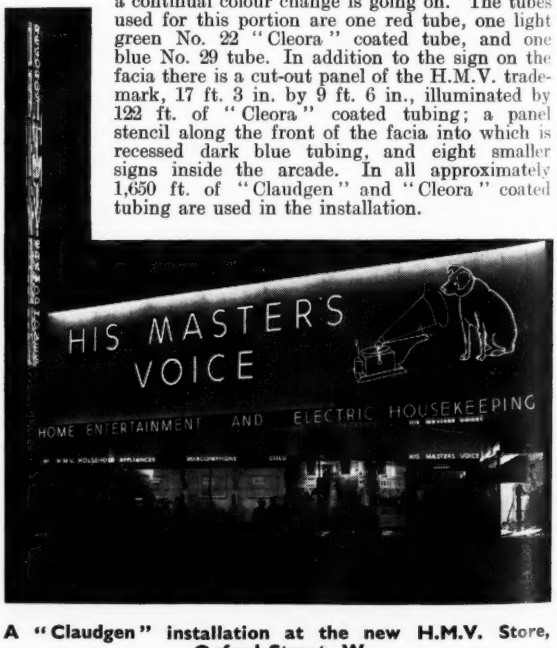
About three years ago we reviewed the first edition of a work bearing the above title by Major G. Harrison and F. C. Mitchell and drew attention to its usefulness as a guide to manufacturers and distributors. By the use of ingenious little Neurath pictorial diagrams and tables it analyses the population of Great Britain according to areas, ages, sex, size of family, income, &c. A new edition has now appeared (George Allen & Unwin, Ltd., 40, Museum Street, W.C.1; price 12s. 6d.), which takes account of the changes which have occurred since 1936, and it is claimed that the volume deals with the general trend of things and acts as a corrective to the short-term views which are too often taken nowadays. Two useful appendices are included—one giving current statistics of commercial interest and the other an explanatiion of the statistical methods employed by the compilers.

Change of Address

Messrs. Kennedy & Donkin are removing on Monday next to Alliance House, 12, Caxton Street, Westminster, London, S.W.1. The telephone numbers and telegraphic addresses will remain unchanged.

An Effective Neon Installation

In our last issue we reported the opening of the new H.M.V. showrooms in Oxford Street, W. A feature of these premises is the "Claudgen" neon display upon the exterior. The vertical sign reads "Records, H.M.V. Gramophones," the sign H.M.V. being in 3-ft. letters illuminated by ruby red neon tubing against a bank of 15-mm. blue tubing. The sign on the facia, "His Master's Voice," is in 30-in. block type letters with channel faces illuminated by a double line of 15-mm. ruby red tubing. The letters are fixed individually to a cove background, which is illuminated from concealed tubes in the top and bottom arranged so that a continual colour change is going on. The tubes used for this portion are one red tube, one light green No. 22 "Cleora" coated tube, and one blue No. 29 tube. In addition to the sign on the facia there is a cut-out panel of the H.M.V. trade-mark, 17 ft. 3 in. by 9 ft. 6 in., illuminated by 122 ft. of "Cleora" coated tubing; a panel stencil along the front of the facia into which is recessed dark blue tubing, and eight smaller signs inside the arcade. In all approximately 1,650 ft. of "Claudgen" and "Cleora" coated tubing are used in the installation.



A "Claudgen" installation at the new H.M.V. Store, Oxford Street, W.

"Craftsmanship"

We have received from the Lancashire Dynamo & Crypto, Ltd., a well-produced publication entitled "Craftsmanship," in which are recorded the opinions of some of the employees who have been with the company for many years of the motors which they make and their life and experiences with the company.

British Engineers' Handbook

The British Engineers' Association has issued the 1939 edition of "B.E.A. Classified Handbook of Members and their Manufacturers." This handbook, which is published with a view to establishing a closer contact between buyers overseas and the companies who are members of the Association, contains an alphabetical list of members with their addresses, and brief particulars of their manufactures, and also a classified list of plant and apparatus made by members. A sectional list of British Standards (Mechanical) is included. The handbook is being circulated to selected known buyers in the home and overseas markets, and copies can be obtained free from the Secretary of the Association, 32, Victoria Street, London, S.W.1.

Anglo-Swedish Trade Discussion

The delegation of Swedish industrialists which is to discuss the furthering of trade interests between Sweden and Great Britain will arrive in England to begin conversations on July 4th. This delegation follows the recent visit to Sweden of Mr. R. S. Hudson, M.P., (Department of Overseas Trade) and will be sponsored by the Swedish Federation of Industries and Export Association. The Federation of British Industries will organise meetings between the Swedish delegates and representatives of industrial groups in Great Britain, with the aim of strengthening reciprocal trade relations between the two countries. Mr. C. F. I. Ramsden, foreign director of the F.B.I., will arrive in Stockholm on June 5th to discuss the necessary arrangements for the reception of the Swedish delegates in this country, and to meet the heads of the F.B.I.'s "opposite number" in Sweden.

A New Refrigerator Cut-out

The General Electric Co., Ltd., has prepared a display cut-out for the new 3 cu. ft. "Coldair" DMD31 refrigerator. This attractive display, which is printed in twelve colours, emphasises the three main features of the refrigerator, its low price, big capacity and small floor space.

A new "Coldair" refrigerator cut-out

Willing's Press Guide

The 1939 edition of "Willing's Press Guide" (Willing's Press Service, Ltd., 356-364, Gray's Inn Road, London, W.C.1, price 2s. 6d.), contains all the features which have proved so popular in past issues. Many new publications which have made their appearance since the last edition are included, and the revised lay-out adopted a year ago in the sections dealing with the Dominions, colonies and foreign countries has been continued. Particulars of many more publications have been included, and the feature occupies several more pages than before.

Equipment for A.R.P. Shelters

Pilkington Bros. have placed instructions with Standard Telephones and Cables, Ltd., for a public address equipment and magneto telephone system to be installed in the A.R.P. shelters at their St. Helens (Lancs) and Doncaster (Yorks) works. This equipment will be complete with emergency power plant and facilities for the transmission of radio and gramophone records over the system.

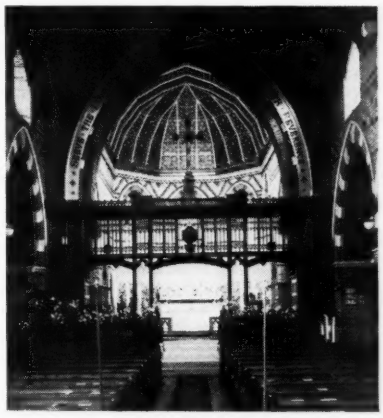
Tin Electroplating

Electroplating is a convenient way of coating other metals with tin, and uncertainty as to the best methods of carrying out this process should be dispelled by a handbook just published. "Electro-tinning," Publication No. 92, contains working instructions compiled by Mr. S. Baier, who discusses in turn the advantages and drawbacks of each type of bath. It should enable the most satisfactory type to be chosen for any specific purpose; it describes in detail how to make up, use, control and maintain the baths, with explanations of the theory underlying them. None of the apparatus required is expensive or complicated and, provided that the instructions given are adhered to, perfectly satisfactory results should be within the reach of all.

Copies of the publication may be obtained free of charge from the International Tin Research and Development Council, Fraser Road, Greenford, Middlesex.

A Church Lighting Installation

In the accompanying illustration we show the apse of Cheam Parish Church illuminated by a "Sol-lite" fitting installed by T. Hall & Co., Ltd., of Cheam. The "Sol-lite" is a newly devised system of colour-corrected mercury vapour lamp lighting. The fitting has an assemblage of mirrors by which the luminous flux emitted from the various lamps is mixed. The new installation, which replaces six reflector fittings totalling 1,000 W, shows the brilliance which can be obtained from one 680-W "Sol-lite" unit.



Apse of Cheam Parish Church lighted by a "Sol-lite" fitting

Prices of Materials

Henry Gardner & Co., Ltd., report, May 17th: Copper bars (best selected), sheet and rod, no change. English pig lead, no change. Spelter, £14 10s., 17s. 6d. inc. English block tin, £225 15s., £1 inc. Mercury, no change.

Frederick Smith & Co. report, May 17th: Electrolytic copper bars, £48 7s. 6d., 7s. 6d. decrease. Ditto, ditto, wire rods, £53 2s. 6d., 7s. 6d. decrease. Ditto, ditto, h.c. wire, 7 13/16d., 1/16d. decrease. Silicium bronze wire, no change.

Edward Till & Co. report, May 17th: India rubber, Para fine, no change.

New Catalogues and Lists

General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.—Two booklets dealing with "Electricity in Agriculture" (pp. 24) and "Switchboard Panels and Accessories" (pp. 44).

Metropolitan Electric Supplies, Ltd., Exchange House, Old Change, London, E.C.4.—A list of conduit fittings.

James Howden & Co. (Land), Ltd., Caxton House, London, S.W.1.—A leaflet describing a fan for A.R.P. shelters.

Electro-Dynamic Construction Co., Ltd., St. Mary Cray.—A new leaflet dealing with convertors for radio purposes.

United Insulator Co., Ltd., 12-16, Laystall Street, London, E.C.1.—Leaflets describing ceramic trimmer condensers.

Aidas Electric, Ltd., Sadia Works, Rawdell Road, Northolt.—A leaflet giving details of the new "Sadia Star" water-heater.

J. H. Tucker & Co., Ltd., King's Road, Tyseley, Birmingham, 11.—New publicity matter dealing with the conformity of plugs and sockets to B.S.S. 816 and also with the advantages of AC slow-break switches.

Ferranti, Ltd., Hollinwood.—Details of a new water-boiler for hotels and restaurants.

British Insulated Cables, Ltd., Prescot.—Leaflet No. 333, describing multiple telephone cables.

Harcourts, Ltd., 1, Kean Street, Aldwych, London W.C.2. A 94-page illustrated art catalogue of architectural and commercial lighting fittings.

Private Arrangement

L. Jacobs, trading as Loujay Radio, 162, High Street, Peckham, London, S.E.15.—The creditors were called together recently, when a statement of affairs was submitted showing liabilities totalling £766. The net assets were £205, leaving a deficiency of £560. It was decided that the estate should be administered under a deed of assignment in favour of Mr. Kano, of Kano Clark & Co.

Bankruptcy Proceedings

J. Laycock, "Lochend," Elam Wood Road, Riddlesden, Keighley, Yorks, lately carrying on business as Laycock & Ridding, 67, South Street, Keighley, electrician.—The first meeting of creditors was held at the Official Receiver's Office, Hallfield Chambers, 71, Manningham Lane, Bradford, on May 12th. Debtor said his failure was due to lack of working capital and insufficient profit on contract work. His gross liabilities were £196, of which £191 was expected to rank for dividend, with assets of £43, leaving a deficiency of £148. The case being a summary one was left in the hands of the Official Receiver, as trustee.

W. G. Baker, carrying on business under the style or firm of Baker & Co., 19A, Angell Hill, Bury St. Edmunds, radio dealer.—The first meeting of creditors in this matter was held on May 10th at 13A, Great Colman Street, Ipswich. Debtor had prepared a statement of affairs which showed unsecured

liabilities of £330 and net assets of £111, leaving a deficiency of £219. The case was left in the hands of the Official Receiver as trustee.

L. F. R. Dean, carrying on business at Stair House Shops, Lamberhurst, Kent, radio dealer.—At the public examination held at the Town Hall, Tunbridge Wells, recently, the statement of affairs showed ranking liabilities of £323, and estimated assets of £13, leaving a deficiency of £305. Debtor attributed his failure to lack of capital and bad trade. The examination was formally adjourned for closing.

A. Elliott, electrical engineer, 14A, Hargreaves Street, and 143, Trafalgar Street, Burnley, and also under the style of Vacs Domestic Appliances, at the Empress Hall, Butterworth Street, Littleborough.—Public examination, June 13th, at the County Court House, Burnley.

E. P. Hallybone, radio dealer and electrical engineer, 15, Kneesworth Street, Royston, Herts.—Public examination, May 19th, at the Guildhall, Cambridge.

M. R. Horne (Malcolm & Stewart), wireless and electrical retailer, 491, Alum Rock Road, Birmingham.—Application for discharge to be heard on June 13th at the Court House, Birmingham.

O. Wales, electrical engineer, 2, Rusper Road, Horsham.—Trustee, Mr. V. R. Fletcher, 8, Old Steine, Brighton, Official Receiver, released May 4th.

C. H. Chadwick, wireless dealer, Mill Road, Cromer.—Trustee, Mr. F. R. D. Walter, Castle Chambers, Opie Street, Norwich, Official Receiver, released May 4th.

M. F. Clifford and **D. T. Hill** (Clifford & Hill) radio dealers, 69, Longmore Street, Balsall Heath, Birmingham, and 149, Sand Pits, The Parade, Birmingham.—Last day for receiving proofs for dividend, May 23rd. Trustee, Mr. R. K. Clark, 37, Temple Street, Birmingham, Official Receiver.

H. M. Wise (H. M. Wise & Sons), electrical engineer and radio dealer, Corvedale Road, Craven Arms, Salop.—First meeting May 20th at 133, St. Owen Street, Hereford. Public examination June 16th at the Town Hall, Leominster.

S. F. Philpott (S.F.P. Electrical Co.), electrical engineer, North Bar Works, Banbury, Oxford.—Application for discharge to be heard on June 21st at the Town Hall, Banbury.

H. G. Hayward, electrical engineer and radio dealer, 42, Wilton Avenue, Southampton, lately trading at Cambridge Road and formerly carrying on business at 186, Bitterne Road, Bitterne Park, Southampton, as Modern Electric Service.—Discharge suspended for three months until July 18th, 1939.

L. G. Baker and **C. Silva-White,** trading at 21, Brentgovel Street, Bury St. Edmunds, and at Mildenhall, Ely, and Elmswell as L. Baker & Co., and at Stowmarket as L. Baker White & Co.—Trustees, Mr. W. A. J. Osborne, 11-12, Finsbury Square, London, E.C.2, and Mr. R. P. Spanton, 2-3, Guildhall Chambers, Bury St. Edmunds, released February 24th.

J. W. Watson, electrical engineer, 154, Aldborough Road, Seven Kings.—Last day for receiving proofs for dividend May 27th. Trustee, Mr. J. L. Poland, 29, Russell Square, London, W.C.1.

V. W. Henry, radio and electrical engineer, Acle, Norfolk.—First and final dividend of 1s. 1½d. in the £, payable May 13th at the Official Receiver's Office, Castle Chambers, Opie Street, Norwich.

A. F. Peacock, radio engineer, 15, Bank Street, Teignmouth.—First and final dividend of 2s. 8½d. in the £, payable May 19th at the Official Receiver's Office, Exeter Bank Chambers, Broadgate, Exeter.

J. Bott, wireless dealer, 41, Wilford Road, Nottingham.—Receiving order made May 8th on a creditor's petition.

Company Liquidation

Capel's Wholesale Wireless Co., Ltd.—Winding up voluntarily. Liquidator, Mr. L. S. Findlay, 35, Windsor Place, Cardiff. Particulars of claims to the liquidator by June 26th.

Information Department

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, &c., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the following:—

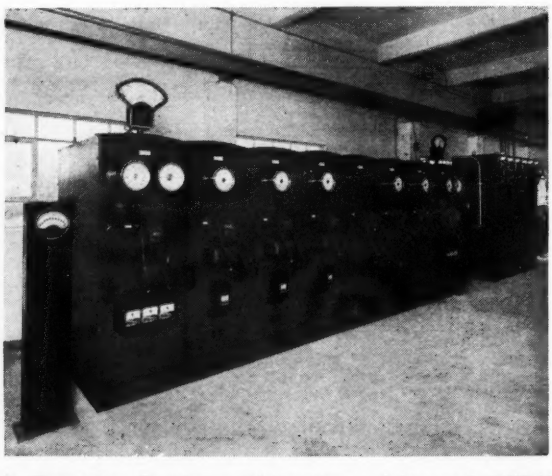
ZODIAC massage machines.
DECEL cable.

Two Factory Installations

A PARTICULARLY interesting and comprehensive installation of Crompton Parkinson switchgear, motors and cable, with transformers by the British Electric Transformer Co., Ltd., has recently been completed at the Austin Aircraft "shadow" factory.

The power supply is 400 V and 3,300 V, three-phase, 50 cycles, the higher voltage supply being used for the heavier drives such as compressors and testing motor generator. There is also a separate high-voltage supply of 11,000 V brought into the flight shed. Equipment comprising "T.A.P." breakers controls the incoming high-voltage feed to a 250-kVA transformer, the output being controlled by three "Klad" breakers. A 9-kW rectifier supplies DC for lighting at 110 V.

In the main sub-station there are two 4,000-kVA and three



A Crompton Parkinson high-voltage eight-panel 3,300-V switchboard, and two remote control panels at the Austin aircraft factory

1,250-kVA transformers. The 4,000-kVA units the three-phase, 50 cycles, "O.N." outdoor type transformers, voltage ratio 33,300/3,300. They are equipped with on-load tap-change gear, push-button operated, the control pillars being mounted alongside the 3,300-V truck board. The 1,250-kVA units are three-phase, 50-cycle "O.N." outdoor type transformers, voltage ratio 3,300/400. The low-voltage switchgear comprises three main incoming panels of 2,500 A rating and a breaking capacity of 25,000 kVA; two bus section panels equipped with similar switches and a total of twenty-one "Klad A" outgoing feeder panels. The high-voltage board comprises an eight-panel board of standard type "DA.2," truck cubicle equipment, controlling the 3,300-V supply. The trucks are fitted with tested breakers of 150-mVA capacity. The motor-generator control equipment includes a high-voltage starting panel on the Korndorffer principle. There is also a DC switchboard controlling the supply from the generator and the feeders to the various engine testing cubicles, and used in conjunction with a synchronous motor-generator set.

In the factory itself a large number of Crompton motors have been installed for a wide range of purposes, especially for driving machine tools. A series of 30-HP variable-speed DC motors operate in connection with the running-in of the aero engines and two 190-HP, 0.7 lead, 333 RPM self-synchronising auto-synchronous motors drive the air compresor. All the auxiliaries in the boiler house, including fans, elevators, pumps, &c., are motor driven, "Klosd" totally enclosed, slip-ring and squirrel-cage motors being used on the pumps.

The heating and ventilation of the main factory was arranged by Heat & Air Systems. Large units heated by high-pressure hot water are placed at intervals along the roof of the building and the heated air is distributed through ducts. For air conditioning many Crompton motors are used to drive the fans.

A Confectionery Factory

The tonnage output of the confectionery factory of W. H. Dunn & Co., Ltd., established at Burn Park Works, Sunderland, in 1928, has trebled during ten years of operation. Such an increase has necessitated many extensions to equipment, the latest being the installation of additional switchgear and a transformer. The factory is supplied by two transformers. That recently added, manufactured by the British Electric Transformer Co., Ltd., is rated at 450 kVA and operates from 5,000 to 400 V, three-phase. The one used prior to the extensions is a 250-kVA transformer working from 5,000 V to 220 V, three-phase.

A Crompton Parkinson two-panel 300-A metal-clad and compound-filled switchboard controls the two transformers. The low-voltage supplies from both transformers are controlled by a C.P. low-voltage switchboard in which the bus-bars are divided into two sections, one of 220 V the other 400 V. The 220-V section of the incoming supply is controlled by an Ellison 600 A circuit-breaker. On the 400 V section the supply is controlled by a 700 A "Klad A" unit. Unbalanced load kWh meters were supplied to measure the energy consumption on each side of the factory, and power factor meters were provided on both sets of bus-bars.

ELECTRICITY SUPPLY

Proposed Birkenhead Power Station. Inquiry at Bristol. Glasgow Council Houses and Electric Heating. Floodlighting the Fenland Tulip Fields

Aberdeen.—X-RAY EQUIPMENT.—The Public Health Committee recommends the purchase of X-ray equipment for Woodend Hospital at a cost of £3,360.

Aldershot.—CHANGE-OVER.—The Town Council is to change over from DC to AC in Lansdowne Road, Cargate Hill, Upper Elms Road, Vine Street, and Upper Lysons Road at an estimated cost of £1,208.

Birkenhead.—PROPOSED BROMBOROUGH POWER STATION.—The Electricity Committee has under consideration a scheme for building a new power station upon a site at Bromborough. At present the Corporation distributes electricity generated at the Clarence Dock, Liverpool. Up to about eighteen months ago Birkenhead had its own generating station at Craven Street; this is now used as a receiving station for bulk supplies. If the scheme receives approval, the proposed new station in its initial stages will have two 30,000-kW turbo-alternators, its ultimate capacity being 120,000 kW. The Electricity Committee recommends the Town Council to apply to the Electricity Commissioners for their consent to establish the selected station and to borrow the necessary money.

Bishop's Stortford.—EMERGENCY PLANT.—The Area Guardians Committee, in an A.R.P. scheme which it has submitted to the County Public Assistance Committee, recommends the purchase of an emergency electricity supply plant, costing £600, for the Haymeads Institution.

Blackpool.—CONVERSION TO STANDARD FREQUENCY.—Cables are being replaced at Blackpool in connection with the change-over in frequency from 83 cycles to 50 cycles. Only 2,000 consumers out of a total of 43,000 now remain on the 83-cycle system.

A.R.P.—The Electricity Committee is to spend £3,729 on air-raid precautions at the electricity works.

Bridlington.—BETTER LIGHTING.—The Town Council is to improve the electric lighting in 39 streets.

Bristol.—INQUIRY INTO CHARGES.—An inquiry of importance to certain local authorities was held at Bristol on Friday, when Mr. Henry Nimmo, Chief Engineering Inspector of the Electricity Commissioners, and the representatives of Bristol Electricity Department and of Warmley and Mangotsfield District Councils discussed the question of electricity charges. The inquiry arose out of the application by Bristol Corporation to the Electricity Commissioners for an extension for a further five years of the 10 per cent. surcharge to consumers of electricity outside the Bristol city boundary.

Burton Latimer.—STREET LIGHTING.—Improved street lighting is to be considered by the Urban District Council.

Burton-on-Trent.—MAINS EXTENSIONS.—The Electricity Committee is to extend mains to the Goodman Street sub-station district at a cost of £8,872, and lay an additional cable in the district around Bank Passage, Swadlincote, costing approximately £1,500.

Carlisle.—LOANS.—Sanction is being sought by the Electricity Committee to borrow £20,000 for mains and services, £7,000 for transformers and sub-stations, and £7,000 for assisted wiring.

MAINS.—The Electricity Committee is to extend mains at a cost of £646.

Chichester.—SUPPLY TO GOODWOOD.—A supply of electricity is to be given to the Goodwood Estate, and for this purpose sanction is to be sought to a loan of £3,151.

Clitheroe.—SUPPLY TO BROWNSHOLME HALL.—The Town Council proposes to afford a supply of electricity to Brownsholme Hall.

Derby.—SUPPLY TO FARM.—The Town Council proposes to supply electricity to Champion Farm, Windley.

East Ashford (Kent).—ELECTRICAL DEVELOPMENT.—At a recent meeting of the Rural District Council it was reported that the Electricity Commissioners had heard a verbal appeal from the chairman, Major Kirby, and Mr. W. P. Spens, M.P., for electricity in certain areas of the district, and that they had promised to take the matter up.

East Ham.—HIGH-VOLTAGE CABLE.—The Electricity Committee is to supplement the high-voltage feeder to the northern part of the borough at a cost of £1,915.

Gateshead.—UNDERGROUND MAINS.—Plans by the North-Eastern Electric Supply Co., Ltd., for underground cables in Split Crow Road, Highfield Gardens, Highfield Road, Pensher Street and the Highfield Estate have been approved by the Town Council.

Glasgow.—ELECTRICITY IN COUNCIL HOUSES.—The Housing Committee has resumed consideration of a suggestion that provision be made in the Penilee Scheme for electric heating in bedrooms provided with gas fires. The cost would be 22s. 6d. for each 3-apartment house and 45s. for each 4- and 5-apartment house, a total of £3,300 for the whole scheme. To make similar provision in existing schemes would cost £67,601.

MAINS.—The Electricity Committee is to lay distributing mains at a cost of £5,337.

Gt. Yarmouth.—HEATING DECISION REFERRED BACK.—In order that tests might be carried out at which the members of the Housing Committee could be present, the Council has referred back for further consideration the question of the method of heating to be provided in the flats and maisonettes to be erected on the site of clearance areas.

FEEDER TO GORLESTON.—In consequence of the development of the Gorleston district it has been found necessary to lay an additional feeder cable from the power station to Gorleston at an estimated cost of £8,496.

Grimsby.—A.R.P.—The Electricity Committee has approved a scheme costing the undertaking £869 and the C.E.B. £1,370 for the protection of transforming plant from fire in case of air raids. Steps taken by the chief engineer for the protection of workers required to keep the plant in operation have also been approved.

Hastings.—OVERHEAD LINE.—The Electricity Committee is to erect an overhead line from Telham Lane sub-station, Battle, to Forewood pumping station at a cost of £1,250.

Helensburgh.—STREET LIGHTING.—After hearing a report by the inspector of lighting the Town Council has agreed to have electric lighting in Clyde Street.

Hove.—CHANGE-OVER.—The Electricity Committee is to change over the south-eastern area at a cost of £550.

Johnstone.—STREET LIGHTING.—Consideration is being given by the Town Council to an electric street lighting scheme for High Street, Graham Street and M'Dowell Street.

Lichfield.—SUPPLY TO YOXALL.—A supply of electricity is to be given by the Electricity Committee to Hadley End and Wood Lane, Yoxall, at an estimated cost of £1,800.

Luton.—SODIUM LIGHTING.—For over twelve months the municipal authorities have been investigating the merits of tungsten, mercury and sodium lamps in connection with street lighting. After careful investigation they have decided on sodium, and improvements are now being carried out in the lighting of Park Road, which is the first section to be put into service, under the direction of Mr. W. H. Cooke, the chief electrical engineer to the Corporation. This road is the main thoroughfare from the Vauxhall Motor Works, and at certain times of the day it carries an exceptionally high volume of traffic. As no underground service was available and no load other than street lighting could be expected—since the road is entirely undeveloped—it was decided to use overhead wiring, as being the most economical scheme The standards are all mounted on one side of the road, spaced 40 yds. apart, with a mounting height of 25 ft. Thirty-five points are used for this section, comprising "Golden Ray" refractor lanterns supplied by the Engineering & Lighting Equipment Co., Ltd., with "Philora" 140-W sodium lamps supplied by Philips Lamps, Ltd. Other roads, involving altogether approximately 100 lighting points, will be similarly equipped in the near future.

Sodium lighting at Park Road, Luton

Middlesbrough.—HOSPITAL WIRING.—Rewiring of the Holgate Hospital by direct labour is to be undertaken by the Town Council. The work will be done in sections over a period of four years.

Newcastle-on-Tyne.—NEW SWITCHBOARD.—The City Transport and Electricity Committee is to purchase an additional high-voltage switchboard panel at a cost of £15,150.

Newcastle-under-Lyme.—BETTER LIGHTING.—The Town Council proposes to improve the electric lighting in Etruria Road, Basford.

Peterborough.—SWITCHGEAR.—The sum of £22,011 is to be spent on high-voltage switchgear at the power station.

MAINS EXTENSIONS.—Mains are to be extended in Padholme Road at cost of £230.

Repton.—SUPPLY TO SUTTON.—The Derby & Notts Electric Power Co. is to extend its mains to Sutton-on-the-Hill.

Rhyl.—CHRISTMAS ILLUMINATIONS.—Representatives of various Rhyl traders' associations are considering a scheme for providing special street and shop illuminations in the shopping centre during December. The Urban District Council has promised assistance and has undertaken to negotiate with the North Wales Power Co. to ascertain if the difficulty over the "peak supply" can be overcome or removed.

Scarborough.—LOANS.—Application is being made by the Town Council for sanction to borrow £30,000 for mains and services, and £2,000 for sub-station equipment.

This picture shows the beautiful effect achieved by the illumination of an area of the Lincolnshire tulip bulb fields

Sedgley.—SUB-STATIONS.—The Midland Electric Corporation is to erect sub-stations in Abbey Street and Jews Lane.

South Shields.—METER-TESTING EQUIPMENT.—The Electricity Committee is to purchase meter-testing equipment at a cost of £300.

Spalding.—FLOODLIGHTING TULIP FIELDS.—The electricity department, under the direction of the manager, Mr. F. R. C. Roberts, is experimenting with the floodlighting of one of the famous tulip fields in the district. A number of floodlamps have been installed by the side of the field, but they will not actually be brought into use until the tulips are at their very best.

Stockton-on-Tees.—SUB-STATIONS.—The Town Council is to buy equipment for four new sub-stations at a cost of £2,378.

Sunderland.—SUB-STATION.—The Town Council is to obtain tenders for a sub-station in Prospect Row.

Tew Law.—ELECTRICITY MAY REPLACE GAS.—The Urban District Council has decided to obtain expert opinion on the gasworks, with a view to the possibility of closing it down and changing over to electricity. An expenditure of over £2,000 is required to bring the works up to date. For many years the gasworks has been the chief revenue-producing concern of the Council.

West Hartlepool.—ELECTRICITY FOR HOUSES.—Electricity is to be installed in 100 Council houses now under construction.

SUB-STATIONS.—Plans for a sub-station in Brougham Terrace for the North-Eastern Electric Supply Co., Ltd., have been approved by the Town Council.

Wigan.—SUPPLY TO ROBIN HOOD.—The Lancashire Electric Power Co. has notified the Rural District Council that it is giving further consideration to the supply of electricity to the Robin Hood district, as it is anxious that it should be dealt with from its own system. There is little likelihood of a supply being given to Worthington.

Wolverhampton.—SUPPLY IMPROVEMENT.—The Electricity Committee is to improve the supply in Newbridge Crescent district at a cost of £202.

BULK SUPPLY.—The Electricity Committee is to increase the load to the Efandem Co., Ltd., at a cost of £108, and provide a bulk supply to I.C.I. Metals, Ltd., at a cost of £2,774.

SUB-STATION.—The Electricity Committee is to provide a sub-station in Eccleshall Avenue, Oxley, at a cost of £671.

Overseas

Algeria.—ELECTRIC POWER SUPPLY PROGRESS.—The amount of electricity furnished by the port power station of the Société des Forces Motrices d'Algérie to the networks of the Algiers sector of the Société Algérienne d'Eclairage et de Force rose from 48,607,000 kWh in 1937 to 49,270,000 kWh last year, while the Ain-Tinzert power station produced 9,675,000 kWh, as against 8,798,000 kWh in 1937. On the other hand, the Mers-el-Kebir and Ain-Fekan power stations supplied 34,687,000 kWh (31,161,000 kWh in the preceding year) to the distributing networks of the Société d'Eclairage et de Force in the Oran sector. The company is studying, jointly with the other local concession-holders, a programme for the electrification of Algeria, the general lines of which have already been laid down by the Governor-General. It comprises the harnessing of hydraulic resources and the setting up of a high-voltage transmission system. It is stated that the programme is to be carried out by stages extending over several years.

Argentina.—ELECTRIC POWER SUPPLY PROGRESS.—According to the report for last year of the Compania Hispano-Americana de Electricidad (Chade), the output of the power stations in the city and province of Buenos Aires amounted to 1,269,612,000 kWh as compared with 1,213,393,000 kWh in 1937, an increase of nearly 6 per cent. The number of consumers increased during the twelve months which ended on December 31st last from 649,167 to 678,929.

The extension work at the Dock-Sud power station during 1938 included the provision of three new boilers and a 33,000-kW turbo-alternator set which are expected to be ready for operation during next month.

Two other new boilers with a capacity of 75 tons of steam per hour for the same plant have also been ordered. These are for installation next year.

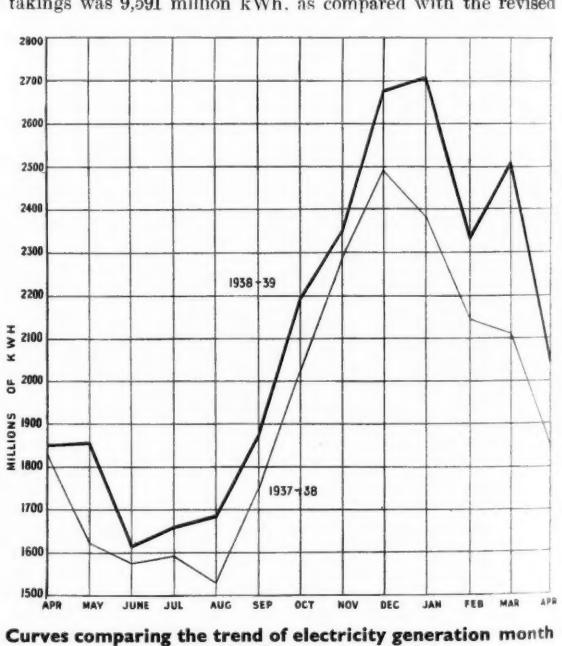
The output of the power stations of the Société d'Electricité de Rosario, which supply the town of that name, during last year amounted to 140,875,000 kWh as compared with 131,473,000 kWh in 1937.

The number of consumers connected to the system increased during the twelve months from 70,835 to 73,194. In order to meet the increasing

Generation of Electricity in April

OFFICIAL returns rendered to the Electricity Commissioners show that 2,046 million kWh was generated by authorised undertakings in Great Britain during April, as compared with the revised figure of 1,849 million kWh in the corresponding month of 1938, representing an increase of 197 million kWh, or 10.7 per cent. The number of working days in the month (*i.e.*, excluding Sundays and Bank Holidays) was twenty-three as against twenty-four last year.

During the four months of this year up to the end of April the total amount of electricity generated by authorised undertakings was 9,591 million kWh, as compared with the revised figure of 8,487 million kWh for the corresponding period of 1938, representing an increase of 1,104 million kWh, or 13 per cent.



Curves comparing the trend of electricity generation month by month in the past two years

demand, two new boilers are to be installed at the Sorrento power station while extensions are also being made to the 11,000-V main feeder cables.

France.—HIGH-VOLTAGE TRANSMISSION LINES.—The Société de Transport d'Energie Electrique d'Alsace, of Strassbourg, has applied for powers to establish a 150,000-V transmission line between the Lac Noir, in the Haut Rhin Department to Vincey, in the Vosges, with a branch extension from Arnould to Schirmeck. The Société d'Energie des Alpes and the Société Industrielle de Transport d'Energie Electrique are also jointly preparing plans for a 150,000-V line between Gemissiat and Palente (Doubs). The Société pour le Transport d'Energie Electrique du Massif Central, which has already been authorised to establish a 220,000-V line between Brommat and Chaingy (Corrèze), has now prepared plans for another line at the same voltage between Eguzon and La Mole-Mareges.

JOINT POWER DISTRIBUTION BY COLLIERIES.—Under the auspices of five of the principal colliery undertakings in the Nord Department of France a new company has lately been formed in Paris with the title of the Société de Transport d'Energie Electrique de la Région du Nord (Ternord) to engage in the distribution of electricity generated at the collieries. The Société de l'Electrique du Nord-Ouest has also entered into an arrangement with the Groupement des Producteurs du Massif Central and the Compagnie Centrale d'Energie Electrique to supply the Rouen area with power from the collieries in the Pas de Calais Department, and in this connection is erecting a 220,000-V power transmission line between Amiens and Rouen and a 45,000-V line between Drocourt and Feuchy, together with a number of transforming stations in the district. The Nord-Ouest concern has also taken a financial interest in the Société Normande d'Interconnexion, which is planning to erect a 220,000-V line between Rouen and Aube, linking up with the 220,000-V lines of the Société de Transport d'Energie Centre-Ouest and so provide a supply to Caen.

Germany.—BERLIN'S INCREASING DEMAND FOR POWER.—According to the recently issued report of the Berliner Kraft & Licht Gesellschaft (Bewag), of Berlin, the quantity of electric power produced and purchased by the undertaking amounted during the financial year 1937-38 to 1,936,081,000 kWh, as compared with 1,771,701,000 kWh in 1936-37, the number of consumers increasing during the year from 1,313,789 to 1,495,160. The absorption, as from January 1st, 1938, of the Elektricitatswerk Sudwest Gesellschaft led to a substantial increase in receipts and in the number of customers, while the taking over as at July 1st last year of the concession held by the Märkisches Elektricitätswerk Gesellschaft resulted in a further increase.

HYDRO-ELECTRIC WORKS IN THE OSTMARK.—The Alpen Elektrowerke A.G. of Vienna, which was formed a year ago with a capital of 50 million RM, and is entirely held by a German State-owned company, is to undertake extensive works for the utilisation of Alpine water-power, spread over several years.

Sweden.—UNDERGROUND PLANT.—A rather ambitious private scheme was announced a few days ago, according to which one of the big Swedish cellulose concerns will erect a 135,000 HP plant at Nasseforsen, on the River Faxalven. The turbines and generators will be housed in concrete caves constructed about 250 ft. below the ground level, making the plant practically invulnerable to air-raids.

NEW CROSS-COUNTRY TRANSMISSION LINE.—A new 220-V transmission line 200 miles long has been completed and connected with the Krangede-Horndal-Stockholm line, bringing the total length of the system up to 500 miles and linking Krangede in the north with Malmo in the south. A large transformer plant has been constructed at Nassjo for the supply to the railway system. The transmission line is equipped with a high-frequency carrier-wave system, by means of which the generator load at Krangede may be read off meters at Nassjo. The completion of this long transmission line coincides with the Krangede power plant being expanded by 50 per cent. by the addition of a third set, raising the total capacity to 105,000 kVA under normal load conditions. The plant is the third hydro station in Sweden to exceed 100,000 kVA, the others being at Porjus and Trollhattan.

Krangede hydro-electric station in North Sweden

TRACTION

London.—MODERNISING A "TUBE" LINE.—Throughout last Saturday afternoon and Sunday the "Underground" line between Finsbury Park and Moorgate was closed to traffic to enable it to be modernised and equipped with new rolling stock in conformity with the rest of London Transport's system. This 35-year-old line has hitherto been isolated from the remaining lines, having had totally different stock. It now conforms with orthodox practice, has new signalling equipment and the new lines have been laid at a higher level to enable the smaller coaches to reach platform level.

Sweden.—TRANSPORT CONVERSION SCHEME.—All tram services in the central districts of Stockholm are to be abandoned by January 1st, 1944, at the latest. During this period the trams will be replaced by trolley-buses.

Newcastle-on-Tyne.—PROPOSED NEW TROLLEY-BUS ROUTE.—The City Council has approved the plans of the Transport Committee to convert the Elswick Road tram route to trolley-bus working at a cost of £68,783, including £54,000 for 20 trolley-buses; £7,200 for overhead equipment; and £7,473 towards the reinstatement of the roads. Application will be made to the Ministry of Transport for a Provisional Order to carry out the scheme.

Power Planning in India

OUR Bombay Correspondent reports that the Indian National Planning Committee, jointly appointed by the Provincial Governments in India under the presidency of Pandit Jawaharlal Nehru, has completed its investigation into the electrical power industry of India and has submitted a long report, discussing the present position and making suggestions for new developments. A tentative plan has been suggested for the creation of a Central Electricity Development Board representing the Central and Provincial Governments and other electrical interests in the country.

The function of the Board would be first to co-ordinate, develop, guide and integrate, as far as possible, the supply industry in the country; secondly, to stimulate and guide the proper formation and co-ordinate the policy and efforts of the manufacturing industry to be started. With these aims in view the Board would be empowered:—

(1) To organise at the centre (a) technical research; (b) commercial and statistical services under its control.

(2) To devise legislation for the formation of a Central Financial Trust to work in co-operation with the Board.

(3) To develop suitable trade relations with foreign firms with a view to starting manufacturing industry in India with their co-operation.

(4) To organise Indian technical education and service in co-operation with Indian educational centres and manufacturing firms in India and abroad.

(5) To devise legislation relating to such matters as general supervision, protective tariffs, standard specifications, electricity rates, relations with consumers, electrical prices, &c., which are essential for the healthy development of the industry.

It is suggested that in general the main monetary burden of a supply scheme should be shouldered, as it is done to-day, by the Government of the province in which the scheme is located, whereas the major portion of the capital required for financing a manufacturing concern should come from private resources. The central trust would thus be relieved of a major responsibility and could depend upon the initiative of Provincial Governments and private industrialists to make a success of an undertaking. The sharing of capitalisation by foreign firms whose aid is essential, at least in technical matters, would have to be considered in this connection.

The Provincial Electrical Engineering Departments would maintain the necessary services to work in co-ordination with the central organisation, while provincial surveys relating to power and other resources, potentialities of load development, connection with local industrialists, commercial propaganda and such other matters would be left to Provincial Departments.

Mid-East England Scheme

THE Central Electricity Board has adopted the Mid-East England (Alteration and Extensions) Scheme, 1939 (see ELECTRICAL REVIEW, March 17th). Copies of the Scheme will be obtainable to-morrow (Saturday) from the Stationery Office at 1d.

FINANCIAL SECTION

New Companies. Official Returns of Capital. Debenture Charges. Reports of Electrical Companies. Dividend Announcements. Transactions in Stocks and Shares

New Companies Registered

H. Beney & Sons, Ltd.—Private company. Registered May 8th. Capital, £15,000. Objects: To carry on the business of electrical, lighting, heating, telephone, wireless, mechanical and general engineers, &c. Permanent directors: H. Beney (chairman), 15, Upwick Road, Eastbourne; A. C. Beney, 15, St. Leonards Place, Eastbourne; and W. H. Beney, 152, Longland Road, Eastbourne. Solicitors: Coles & James, Claremont Chambers, Eastbourne.

Metropolitan Railcars (Ganz Patents), Ltd.—Private company. Registered May 9th. Nominal capital, £50,000. Objects: To carry on the business of manufacturers of and dealers in engines, carriages, conveyances, carts, trucks, vehicles, locomotives, rails and tramways and tramway plant and equipment. First directors: P. S. Turner, "Redcourt," Blackdown Avenue, Pyrford, Surrey; and A. J. Boyd, The Grange, Hook Heath, Woking. Solicitor: S. H. Lewis, Crown House, Aldwych, W.C.2.

Isorid, Ltd.—Private company. Registered May 10th. Capital, £100. Objects: To carry on the business of mechanical, electrical and chemical engineers and contractors, manufacturers of agricultural implements and other machinery, &c. Directors: R. W. Begg, address not stated; J. Cousland, 9, Lilybank Gardens, Glasgow, W.2; and D. C. Bulloch (permanent), Brooklyn, Cuckoo Hill Drive, Pinner, Middx. Solicitors: A. Clifford Larke & Co., Suffolk House, Laurence Pountney Hill, E.C.4.

Charles Gates (1939), Ltd.—Private company. Registered May 10th. Capital, £2,000. Objects: To carry on the business of electricians, manufacturers and factors of, sales agents for and general dealers and specialists in electrical appliances and apparatus of every description, particularly in relation to neon lighting and luminous tubes and signs, &c. Subscribers: C. Gates, 35, Britannic Road, Norwich; and G. E. Nudd, "Woodhurst," Intwood Road, Cringleford, Norwich. Secretary: A. W. J. Harley, 28, Grove Road, Norwich.

C. L. Services, Ltd.—Private company. Registered May 10th. Capital, £3,000. Objects: To carry on the business of electrical and mechanical engineers, manufacturers, factors and repairers of all kinds of electrical apparatus and specialists in the manufacture and repair of electrical apparatus for all kinds of road vehicles and aircraft, &c. Directors: H. A. Turnpenny, 477, Brook Lane, Kings Heath, Birmingham, and two others. Secretary: T. B. Vincent. Registered office: Lombard House, Great Charles Street, Birmingham, 3.

Tellux, Ltd.—Private company. Registered May 10th. Capital, £1,000. Objects: To carry on the business of producers of electrical apparatus, domestic, mechanical and industrial accessories and machines, and parts of all kinds, electrical, mechanical and chemical engineers, &c. Directors: S. Schaffer, 112, Ivor Court, Gloucester Place, N.W.1; and G. Roth, 54, St. John's Wood Road, N.W.8. Registered office: 112, Ivor Court, Gloucester Place, N.W.1.

Page & Stibbs, Ltd.—Private company. Registered May 9th. Capital, £2,000. Objects: To acquire the business of Page & Stibbs carried on by C. J. Page at 9/10, Union Street, Cardiff, and to carry on the business of electrical, mechanical and general engineers and contractors, &c. Directors: C. J. Page (permanent) and Mrs. E. M. Page, both of Sea Crest, Penarth. Registered office: 9/10, Union Street, Cardiff.

Radiation Research, Ltd.—Private company. Registered May 11th. Capital £100. Objects: To carry on research in respect of radiation, energy transformation and wave emission, transmission, interference or reception, &c. The directors are: E. S. Shrapnell-Smith, Hound House, Shere, Surrey, and W. H. Trinder, Hawling Manor, Andoversford, Gloucester. Registered office: 50, Pall Mall, S.W.1.

A.C. & D.C. Meters, Ltd.—Private company. Registered May 11th. Capital, £250. Objects: To carry on the business of repairers, overhaulers, and manufacturers of and dealers in all kinds of electric and other meters, &c. The directors are: H. Bolton, "Briarbank," Barrow, nr. Blackburn, and E. B. Wadsworth, 146, Coal Clough Lane, Burnley. Registered office: "Briar Bank," Barrow, nr. Blackburn.

Emco, Ltd.—Private company. Registered May 11th. Capital £1,000. Objects: To carry on the business of dealers in mechanical, electrical and other machinery, plant, engines, motors, machine tools, radio and television apparatus, and electrical, mechanical and other power components, &c. The first directors are: H. D. Webb, 62, Bradford Street, Walsall (permanent), and three others. Secretary: Miss E. Webb. Registered office: 63, Bradford Street, Walsall.

Kenyon Electrical Co., Ltd.—Private company. Registered May 13th. Capital, £300. Objects: To acquire the business of an electrical motor repairer, &c., now carried on by L. Chapman as Kenyon & Co., at 110, Carter Street, Denmark Road, Greenheys, Manchester. The directors are: L. Chapman (permanent governing director and chairman), 30, Union Street, Ardwick, Manchester, and two others. Registered office: 110, Carter Street, Denmark Road, Greenheys, Manchester.

V.S.E. Construction Co. Ltd.—Private company. Registered May 11th. Capital, £500. Objects: To carry on the business of electrical, mechanical and constructional engineers, makers of scientific instruments, amplifiers and component parts, &c. The directors are: W. G. May, Park West, W., and Major M. L. Buller, M.C., Downes, Crediton, Devon. Registered office: 20, Kingsway, W.C.2.

Elite Radio Supplies, Ltd.—Private company. Registered May 12th. Capital, £100. Objects: To carry on the business of manufacturers and repairers of and dealers in radio, television, electrical, scientific and telephone apparatus and installations, &c. The directors are: J. W. Brown and Mrs. Norah Brown, both of 82, Otley Drive, Ilford. Secretary: T. A. E. Joslin. Registered office: 4, Broad Street Place, E.C.2.

Associated Technical Manufacturers, Ltd.—Private company. Registered May 12th. Capital, £2,500. Objects: To acquire the business of L. W. E. Townsend, of Irwell Works, New Bailey Street, Salford, Lancs, so far as such business relates to research work in connection with and the production of lacquers and insulating materials, cellulose acetate compositions, electrical instruments, &c. The directors are: L. W. E. Townsend (permanent director and chairman), 100, Whalley Road, Manchester, 16, and two others. Registered office: Vincent Works, New Islington, Manchester, 4.

A.W.T., Ltd.—Private company. Registered May 12th. Capital, £200. Objects: To carry on the business of manufacturers and repairers of, agents for and dealers in wireless and television sets, electrical goods, &c. The directors are: J. Hearn 43, Eversley Crescent, Ruislip, and D. L. Werschker, 19, St. Kilda Road, W.13. Registered office: 55, High Street, Ruislip.

A. C. Farnell, Ltd.—Private company. Registered May 1st. Capital, £500. Objects: To carry on the business of designers manufacturers and repairers, exporters and importers of, agents for and dealers in radio, electrical and television apparatus; radio, electrical, motor and general engineers. Directors: A. C. Farnell, 12, Heaton Park Road, Heaton, Bradford, and Mrs. E. T. Woffenden, address not stated.

Returns of Electrical Companies

Statements of Capital

Gent & Co., Ltd.—Capital, £50,000 in 20,000 preference and 30,000 ordinary shares of £1. Return dated February 21st, 1939. 7,427 preference and 24,376 ordinary shares taken up. £13,387 paid on 3,957 preference and 9,430 ordinary shares. £18,416 considered as paid on 3,470 preference and 14,946 ordinary shares. Mortgages and charges, £9,000.

Gorseinon Electric Light Co., Ltd.—Capital, £60,000 in £1 shares. Return dated March 8th, 1939. All shares issued and fully paid up in cash. Mortgages and charges, nil.

Elven Mains Manufacturing Co., Ltd.—Capital, £200 in £1 shares. Return dated December 31st, 1938 (filed March 15th, 1939). 152 shares taken up. £152 paid. Mortgages and charges, nil.

F. B. Hellon & Co., Ltd.—Capital, £4,000 in £1 shares. Return dated July 28th, 1938 (filed March 7th, 1939). 3,000 shares taken up. £3,000 paid. Mortgages and charges, nil.

Normand Electrical Co., Ltd.—Capital, £20,000 in £1 shares. Return dated December 29th, 1938 (filed March 23rd, 1939). 12,448 shares taken up. £12,448 paid. Mortgages and charges, nil.

Chesham Electric Light and Power Co., Ltd.—Capital, £300,000 in £1 shares. Return dated March 7th. 225,000 shares taken up. £204,998 paid. £20,002 considered as paid. Mortgages and charges, nil.

Direct Spanish Telegraph Co., Ltd.—Capital, £95,000 in 13,000 ordinary and 6,000 preference shares of £5. Return dated March 13th. 12,931 ordinary and 6,000 preference shares taken up. £94,655 paid. Mortgages and charges, nil.

Invincible Electrical Engineering Co., Ltd.—Capital, £1,000 in £1 shares. Return dated January 13th. 400 shares taken up. £400 paid. Mortgages and charges, nil.

Beck & Moss, Ltd.—Capital, £2,500 in £1 shares. Return dated April 12th, 1938 (filed February 18th, 1939). All shares taken up. £525 paid. £1,975 considered as paid. Mortgages and charges, £400.

Mortgages and Charges

Evrizone Radio & Television Co., Ltd.—Debenture dated May 1st, 1939, to secure £125 charged on the company's property, present and future, including uncalled capital (subject to prior incumbrances). Holder: Wallace A. E. E. Von Koettlitz, 52, Warrington Road, Harrow, Mdx.

Baird Television, Ltd.—Particulars have been filed of loan stock to secure £400,000 and a premium of £5 per £100 loan stock, authorised March 31st, 1939, and covered by trust deed dated April 19th, 1939, charged on the company's undertaking and property, including uncalled capital. The amount of the present issue is £326,150. The trustees are Stephen J. Gordon and Charles J. G. Palmour. Issue on April 28th, 1939, of £256 5s. loan stock, part of a series already registered.

Progress Cables and Accessories Co., Ltd.—Debenture charged on the company's undertaking and property, present and future, including uncalled capital, dated April 20th, 1939, to secure £1,000. Holders: Branch Nominees, Ltd.

Power Equipment Co., Ltd.—Charge on Kingsbury Works, Kingsbury Road, Kingsbury, dated May 3rd, 1939, to secure all moneys due to or become due from the company to Barclays Bank, Ltd.

Receivers Released and Appointed

P. J. Haskins, Ltd.—A. E. Palmer, incorporated accountant, of 84 and 85, High Street, Weston-super-Mare, was appointed receiver and manager on April 24th, 1939, under powers contained in debenture dated April 21st, 1936.

Collins & Scott, Ltd.—A. E. Orbell, 6/7, Old Steine, Brighton, ceased to act as receiver and manager on May 5th, 1939.

Increases of Capital

Grimston Electric Tools, Ltd.—The nominal capital has been increased by the addition of £2,500 in £1 ordinary shares beyond the registered capital of £7,500.

Weir Electrical Instrument Co., Ltd.—The nominal capital has been increased by the addition of £1,000, in £1 ordinary shares, beyond the registered capital of £2,000.

Trevelyans (Birmingham), Ltd.—The nominal capital has been increased by the addition of £3,000 beyond the registered capital of £14,000.

Electrocult, Ltd.—The nominal capital has been increased by the addition of £2,900 in £1 ordinary shares beyond the registered capital of £100.

Reports and Dividends

Johnson & Phillips, Ltd., held their annual meeting on May 11th, when Mr. G. L. Wates (chairman), who presided, said that during 1938 they were able to increase the output capacity of their engineering departments, and might need to do so still further, as the extra accommodation provided had already been overtaken. They had also had to provide increased facilities for their rubber cable department, which had shown excellent results. Their mains cable department, however, had not been able to work to full capacity, and it was apparent that at present the productive capacity of the country in this type of cable was well in excess of demand. This was largely due to several new concerns having come into the field. Some of them had been established in the distressed areas, and had enlisted support from the Government and public bodies on that ground. The not unnatural result had been the creation to some extent of distressed areas elsewhere, as the workpeople in this section in the older established works had simply lost what the newcomers had gained. It was significant that one of these new concerns had already abandoned this line of manufacture, and its works had been closed down and dismantled. They expected that the business they had lost would gradually return.

Referring to the manufacture of machinery for laying submarine cables, which formed an important part of their business when they commenced operations in 1875, he said that for a long period there had been a cessation of submarine cable development. They had, however, in 1938 booked an order for and completed a cable-ship gear for the British Admiralty, and now had in hand a larger gear of their latest design for the British Post Office and another for the Commonwealth of

With regard to rearmament activities, an increasing proportion of the business received from their regular civil customers for their normal products was intended for equipment of armament factories and of industries directly or indirectly engaged on work for the war services. The value of orders received direct from Government Departments had also increased, but still did not represent an undue proportion of their business. As in the past they had striven to maintain their export business and connections, and their overseas branches and agencies had been kept fully supplied. They were increasing their stocks overseas to a level which would minimise the effect of any temporary interruption of supplies which might occur, and one or two of their more important overseas branches were already beginning to build up the nucleus of a local manufacturing organisation.

Good progress had been made with the subsidiary electricity supply companies during the year under review. They now had 329 miles of high-voltage and 195 miles of low-voltage lines in operation. There were over 12,000 consumers and the total sales last year were 22,000,000 kWh. Both Westmorland and Ringmer were agricultural areas, and they had practically 300 farms connected to their systems. Their factory for the manufacture of Permel enamelled wire had been closed down.

Cable & Wireless (Holding), Ltd., held its annual meeting on May 17th, when Lord Pender (governor), who presided, in the course of his speech said that international conditions had naturally had an adverse effect both on business generally and on the financial results of all companies. In view of these facts they had cause to be satisfied with the results of the past year's working, and the figures when compared with 1936 showed the enormous improvement which had taken place in their affairs during the past two or three years.

Curling Studio, Ltd.
Lord Pender

The past year had been one of the most varied they had so far experienced from an investment point of view, and market sentiment had generally followed every change in the political situation. As regards their own reserve fund investments, they had naturally not escaped the general decline, a book value of £12,446,599 being represented by a market value of £10,990,763 at December 31st last. The full depreciation was 11.7 per cent. but a part of this occurred during 1937, and the figure attributable to 1938 was about 6 per cent.

With regard to their offer to all holders of the funded income stock of £25 or under to redeem their stock at par, the number of these small accounts had been reduced by about 9,000. The company had, however, decided not to accept any further offers as from that day.

At the last meeting he referred to the effect of the Empire flat rate scheme and mentioned that it would result in a great stimulation of traffic and a consequent increase in revenue which they derived from that source. The directors' views had already been justified to a very considerable extent. The monthly index statements which had been regularly issued for some years past had been interpreted in a widely diverse manner and did not give a true account of the actual position. When it was first introduced he warned stockholders that the figures could not be regarded as an accurate indication of the total revenues of the holding company, relating as they did to one only of the three main sources of revenue of that company. In the circumstances the monthly announcement would be discontinued and the last traffic index figure would be issued on July 20th.

The Cawnpore Electric Supply Corporation, Ltd.—Presiding at the annual meeting held on May 15th, Mr. K. A. Scott-Moncrieff (chairman) said that in 1938 they sold 2,116,000 kWh more than in 1937, an increase of 2½ per cent. That increase was obtained in spite of the serious effects of the strike of mill and other operatives in Cawnpore, which reduced their output by approximately 10 million kWh. Another matter which affected their revenue account was that they had not yet succeeded in getting the high-pressure steam plant into full operation; although the initial troubles had been largely overcome, they had caused delay in the completion of the turbine plant. Referring to capital expenditure during the year under review, Mr. Scott-Moncrieff said that machinery had accounted for £8,724. This item would be increased during the next few years as they had already placed a contract for a new 15,000-kW turbo-alternator.

The Madras Electric Supply Corporation, Ltd., reports a net profit for 1938 of £74,863, as compared with £75,606 for 1937. The ordinary dividend for the year is maintained at 8 per cent. by the final payment of 5½ per cent., and £43,724 is carried forward (against £41,566 brought in). The report states that the Madras Government has now demanded reductions in existing rates, which if fully enforced would have a serious effect on revenue. Negotiations in connection therewith are still proceeding. The Government recently passed an Act which imposes a tax of half an anna per kWh on all kWh sold at over two annas. Under this Act, the Government may allow the tax to be passed on to the consumer, but in the case of the Corporation it had been intimated that the whole tax would have to be borne by the Corporation. Sales of electricity in 1938 were 48,990,140 kWh (against 45,180,373 kWh).

Callender's Cable & Construction Co., Ltd., reports a balance on profit and loss account of £448,612, as compared with £621,489 in the preceding year, from which the following deductions have been made: Depreciation of buildings, plant and machinery, £60,000; income tax, £60,000; N.D.C., £15,000; debenture interest, £13,500; and preference stock dividends, £56,000. The balance available is £244,113, which with £565,023 brought in makes £809,136. As we have already announced, the ordinary dividend for the year is maintained at 15 per cent. by the final payment of 10 per cent., but no cash bonus is paid this year (against 5 per cent.). Reserve receives £250,000 and £390,548 is carried forward. The report states that the reduction in the profits has been largely caused by a hold up of business due to the critical foreign situation which had the effect of slackening orders for the Erith Works, particularly in the case of extra-high-voltage cables. Orders for rubber cables have been maintained. The general export trade has not been adversely affected. The investments of the company show an increase of approximately £82,000, due principally to the purchase of a substantial shareholding in a Dominion cable manufacturing company and also in one of the company's principal customers.

Siemens Bros. & Co., Ltd., report a profit for 1938 of £301,733, as compared with £256,777 for the preceding year, to which is added £352,644 brought in, making £654,377. It is proposed to transfer £50,000 to special reserve for A.R.P. and to maintain the ordinary dividend for the year at 7½ per cent., leaving £365,627 to be carried forward. The report states that the company's workshops have again been fully occupied and it has been found necessary to make still further extensions to buildings and plant. Meeting: May 19th.

The Telegraph Condenser Co., Ltd., reports a trading loss for 1938 of £8,095. Tax requires £1,744, depreciation £6,982 and directors' fees £1,150, making, with the half-year's preference dividend, a deficit of £21,872. The net profit for 1937 was £21,773. After transferring £10,000 from reserve, a debit balance of £2,883 is carried forward (against a credit of £8,989 brought in). The second half-year's preference dividend has been deferred.

The British Electric Traction Co., Ltd., reports a revenue for the year ended March 31st of £728,513, as compared with £669,404 for 1937-38. Subject to audit, the net revenue, after charging debenture interest, amounted to £482,398 (against £446,472). The final dividend on the deferred ordinary is 2½ per cent., making 5 per cent. for the year (same), and it is also proposed to pay a bonus of 10 per cent., tax free, on fully paid £1 deferred ordinary shares. A similar scrip bonus was distributed in 1937-38 and previous years. After paying dividends of 8 per cent. each on the 8 per cent. preferred ordinary and 6 per cent. participating preference, the balance carried forward is £211,447 (against £185,323 brought in). Meeting: June 16th.

The Telephone Manufacturing Co., Ltd.—The profit for 1938 was £97,418, as compared with £97,470 in the previous year, and the net profit was £28,191 (against £31,749). General reserve receives £9,307, and it is proposed to pay a final dividend of 6½ per cent., making 9 per cent. for the year (same), and to carry forward £6,331 (against £10,937 brought in). It is proposed to increase the authorised capital to £500,000 by the creation of 400,000 shares of 5s., although it is stated that it may not be necessary to make a further issue at present.

Telephone Properties, Ltd., reports net profits for 1938 of £53,108, as compared with £42,741 for the previous year. It is proposed to pay a dividend for the year of 6 per cent., less tax, on the ordinary stock. The distribution for 1937 was the same, but included a cash bonus of 1 per cent.

Richard Johnson & Nephew, Ltd., report a net profit for the year ended March 31st of £73,810, as compared with £76,356 in the preceding year. Pensions reserve receives £10,000; holidays with pay £10,000; and general reserve £20,000. The ordinary dividend for the year is maintained at 9 per cent., and £25,276 is carried forward (against £26,266 brought in).

Edmundsons Electricity Corporation, Ltd., has announced a final ordinary dividend of 3½ per cent., making 6 per cent. for the year. For 1937-38 an interim of 4 per cent. and a final dividend of 5 per cent. has been paid on £3,740,000, together with 2 2/5d. per share on 760,000 new £1 shares. In June, 1938, a share bonus of 50 per cent. was distributed, taking £2,250,000 of reserves, and raising the ordinary capital to £6,750,000. The dividend for 1938-39 is payable on this capital.

The Jersey Electricity Co. earned a revenue of £77,979 for 1938, as against £72,503 in the previous year. The final ordinary dividend is 5¾ per cent., making 8 per cent. for the year (same), and £2,731 is carried forward.

Ever Ready (Ireland), Ltd., states that the net profit for the year to March 31st was £9,558, as compared with £7,791, to which is added £1,243 brought in. Reserve receives £3,000 and the ordinary dividend for the year is 12½ per cent. (against 10 per cent.), leaving £1,161 to be carried forward.

The Sheerness and District Electric Supply Co., Ltd., reports a net revenue for 1938 of £27,085, and after deducting expenses, income tax, and loan interest there is a balance of £18,369. Reserve receives £7,500 and the dividend for the year is maintained at 10 per cent. The balance carried forward is £6,389 (against £6,520 brought in).

The Lewes and District Electric Supply Co., Ltd., reports a net revenue for 1938 of £17,845, as compared with £17,841 for 1937, and after providing for expenses and income tax there is a balance of £12,427. General reserve receives £6,000 and the dividend for the year is 10 per cent., the balance carried forward being £7,248 (against £7,720 brought in).

The Birkdale District Electric Supply Co., Ltd., reports a net revenue for 1938 of £14,161, as compared with £15,399 in the preceding year. After deducting debenture interest, &c., there is a balance of £7,858. General reserve receives £5,000 and the dividend for the year is 6 per cent., leaving £3,621 to be carried forward (against £3,823 brought in).

The Kalgoorlie Electric Power & Lighting Co. is paying a final dividend of 4½ per cent., less tax, maintaining the distribution for the year at 7½ per cent.

Altrincham Electric Supply, Ltd., has declared a final ordinary dividend of 2½ per cent., making 12½ per cent. for the year (same), and a final deferred dividend of 4 22/57ths per cent., making 23 9/57ths per cent. (same).

The Mid Southern Utility Co., Ltd., is issuing £150,000 "C" consolidated (5 per cent. maximum) stock at 99.

Radio Rentals, Ltd., has declared an interim dividend of 3 per cent., less tax (same).

The Hankow Light & Power Co. has announced the payment of a dividend of 7½ per cent. on the cumulative preference and 8 per cent. on the second preference shares. Payment due on January 1st was deferred owing to hostilities.

The Sphere Investment Trust, Ltd., reports a net revenue for the year ended March 31st of £62,806, as compared with £66,750 in the preceding year. The ordinary dividend is maintained at 5 per cent. for the year and £50,712 is carried forward (against £35,756 brought in).

The Adelaide Electric Supply Co., Ltd., is paying an interim dividend of 5 per cent. (same).

Venner Time Switches, Ltd., reports a net profit for 1938 of £28,645, to which is added £15,649 brought in, making £44,294. The ordinary dividend for the year is 20 per cent. (against 27½ per cent.), and £20,294 is carried forward.

Stocks and Shares

TUESDAY EVENING.

THE political situation continues to dominate the markets in the Stock Exchange. One day the atmosphere seems clearer; on the next, the clouds begin to reappear. With conditions in this state it is impossible to expect people to take much active interest in stocks and shares, with the result that sharp price fluctuations occur on a comparatively meagre amount of bidding or offering. The Government's avowed intention severely to limit profits on armament work has the natural effect of limiting investment inquiry. The London Advisory Traffic report is due for publication on the Friday in this week, and is awaited with considerable interest.

Abroad, the unsatisfactory state of affairs in Mexico is reflected in the Mexican Light & Power Company's postponement of the interest, due on the 1st of next month, on its 5 per cent. second mortgage 50-year bonds and debenture stocks. Brazilian Tractions have gone back: Rio bonds are 5 points higher.

Cable Makers' Shares

Shares in the big cable manufacturing firms have long occupied a rather special niche in the field of sound industrial investments. Recognition that things are not quite what they were in the busiest days of the grid's construction has caused no more than a slight fall in prices. Taken together, the accounts published for 1938 have helped to maintain their reputation. Yields at the present prices of the shares can, on the whole, be accounted moderate in these markets. Both the difficulties and the points of advantage in the trade were reviewed at the annual meeting of Johnson & Phillips. On the adverse side, this company has had difficulty in keeping the mains cable department busy. The entry of newcomers into the field has caused productive capacity to outrun the demand. The chairman of Johnson & Phillips puts his faith in the experience and research resources behind the C.M.A. to restore lost business. The rubber cable side of the business is showing excellent results. As previously announced, net profits were slightly up on the year.

With Government plans in the making to limit profits on armament work, it is interesting to note that direct Government orders, although on the increase, do not represent an undue proportion of Johnson & Phillips' total work; the latter comes in the main from an ever widening circle of customers. At the same time, the chairman estimated that more of the orders from regular civil customers had their origin in the defence programme. On the question of A.R.P., it was said that the next accounts would have to show a substantial change in this connection. Reference to this matter is, incidentally, becoming an increasingly familiar interjection in company reports. Johnson & Phillips shares are quoted at 37s. 6d., ex dividend, to yield £6 13s. 6d. per cent. on the 12½ per cent. dividend.

Callender's Report

Callender's Cable Company's accounts and report were scanned for an explanation of the unexpected cut in the distribution from 20 to 15 per cent. Shareholders who looked for reassurance that the results marked a merely temporary lapse were not greatly consoled. After falling from 80s. to 72s. 6d., on the dividend announcement, the price of the shares went back to 67s. 6d. on the report. Responsibility for the fall in net profits from £448,000 to £300,000 (equal to 24.2 per cent. on the ordinary capital) is laid at the door of the international situation, which caused a hold-up of orders. In line with the experience of Johnson & Phillips, the rubber cable section was well maintained. Results in the "super-tension" cable department spoilt the picture. In the ordinary way, the outcome of so trying a year would probably be accepted without undue concern. The net figure still compares well with any recent year except 1936 and 1937, and the 15 per cent. dividend is the same as was paid for many a previous year. The balance sheet retains impressive strength, with reserves of £1¼ millions against a nominal amount of £1,124,000 ordinary capital. Even after the drop in price, the shares yield no more than 4½ per cent. This return indicates plenty of confidence in the company's powers or recuperation.

Siemens' Profits

With the annual report of Siemens Brothers also appearing last week, cable shares have monopolised much of the news in the electrical markets. Siemens' profit of £302,000 compares with £228,500 in 1937. The increase is approximately what had been expected. Heavy expenditure undertaken in 1937 for expansion of buildings and plant was not charged to capital account, being treated as a current expense in that year. Moreover, the expansion scheme was only beginning to bear fruit by the beginning of 1938. From the Siemens report it appears that the works even in the enlarged form are still overtaxed by orders. Further expansion is planned. The report sheds further light on the position of the C.M.A. in the face of competition from independent concerns. This competition has resulted in price concessions, chiefly for long-term contracts, although prices remain at an economic level. A considerable amount of work is being done for the Government. At 22s. 6d. the shares yield £6 13s. 6d.

Electricity Supply

Edmundsons Electricity Corporation have declared the expected final dividend, making 6 per cent. for the year. Allowing for this year's 50 per cent. increase in the capital, the rate equals the 9 per cent. paid for 1937. At 24s. the shares pay exactly 5 per cent. on the money. This is a trifle higher than the average return on electricity supply shares since the marking down of prices in the past month or two. On the most "gilt-edged" of these shares, the yield is between 4¼ and 4¾ per cent. Examples are London Electric, Midland Counties, North Metropolitans, and Scottish Power. On the 5 per cent. mark are British Power & Light and Southern Areas. Among the higher yielders are London Associated, Newcastles, Llanellys and Electric Finance and Securities.

Miscellaneous Matters

Preliminary figures for 1938 show that the British Electric Traction company's profits continued on their upward way without hindrance from the surrounding disturbances. The regular 5 per cent. dividend on the deferred stock is accompanied, as usual, by a 10 per cent. capital bonus, and the undivided profits account is brought up to within sight of £2 millions. The Home Railway market is quieter, but both Southern preferred, at 68½, and the 5 per cent. preference, at 92½, are another point to the good.

The 4 per cent. dividend on Cable and Wireless ordinary stock is shown by the accounts to have been covered with a small margin of revenue, although only with the assistance of the special 3 per cent. tax-free distribution by the subsidiary Marconi's Wireless Telegraph Co. Following the lively recovery of prices since publication of the operating company's accounts, the ordinary stock has advanced a further point, to 46½, and the preference no less than 5 points to 90½. The latter now has the uncommon distinction of being at the highest point of the year.

The Telephone Manufacturing Company proposes to increase the authorised capital by £100,000. Profits for 1938 are virtually unchanged at the previous year's mark. Following a trading loss for the past year, the dividend on Telegraph Condenser preference shares is six months in arrear.

Electric & Musical Industries, at 11s. 3d., have turned dull on the resignation of Sir Louis Sterling, the managing director, on account of a "divergence of view on a matter of internal policy."

ELECTRICAL COMPANIES' SHARES

Prices, Dividends and Yields

Company	1939 High-est	1939 Low-est	Dividend Pre-vious	Dividend Last	Price May 16	Rise or Fall	Yield £ s. d p.c.
Home Electricity Companies							
Bournemouth and Poole	68/3	63/9	15	15	63/9	—	4 14 4
British Power & Light	30/9	26/-	7	7	28/-	—	5 0 0
City of London	33/9	31/-	7½	7½	32/-	—	4 2 6
Clyde Valley	37/9	34/-	8	8	35/-	+6d.	4 11 6
County of London	46/9	41/9	10½	10½	43/-	+1/-	4 17 8
Edmundson's :							
7% Pref.	31/6	30/-	7	7	30/6	—	4 11 10
Ord.	27/9	23/-	9	6	24/-	—	5 0 0
Elec. Dis. Yorkshire	41/6	37/9	9	9	38/9	—	4 12 9
Elec. Fin. and Securities	47/9	45/-	12½	12½	47/6	—	5 5 3
Elec. Supply Corporation	51/9	48/-	12	12	47/-	—	5 2 0
Isle of Thanet	20/-	18/6	4	4	18/6	—	4 6 6
Lancs Light and Power	34/6	29/-	7½	7½	31/3	—	4 16 0
Llanelly Elec.	22/6	21/-	5½	5½	21/-	—	5 4 9
Lond. Assoc. Electric	29/3	26/3	7	7	26/3	—	5 6 8
London Electric	34/3	32/-	7	7	33/-	—	4 4 10
London Power Deb. Red.	106½	102½	5	5	102½	—	4 17 6
Metropolitan	51/-	45/3	12	12	46/3	—	5 4 0
Midland Counties	38/9	34/-	8	8	37/-	+9d.	4 6 6
Mid. Elec. Power	41/9	38/3	8	9	38/9	—	4 13 0
Newcastle Elec.	28/9	26/6	7	7	27/-	—	5 3 8
North Eastern Electric :							
Ordinary	32/3	28/6	7	7	28/6	—	4 18 3
7% Pref.	32/6	30/-	7	7	31/-	—	4 10 4
Northampton	48/-	45/-	10	10	47/6	—	4 4 2
Notting Hill 6% Pref. (£10)	13½	13	6	6	13	—	4 12 4
North Met. Elec. :							
Ordinary	46/6	41/6	10	10	43/3	+9d.	4 12 7
6% Pref.	29/-	27/6	6	6	27/6	—	4 7 3
Richmond Elec.	29/-	27/3	7	7	27/6	—	5 1 10
Scottish Power	38/9	33/9	8	8	34/3	+6d.	4 13 5
Southern Areas	22/9	19/6	4½	5	20/-	—	5 0 0
South London	30/9	28/-	7	7	28/-	—	5 0 0
West Devon	23/3	22/6	5	5	22/6	—	4 9 0
West Glos.	21/3	18/-	2	2½	18/6	+6d.	2 14 1
Yorkshire Elec.	38/6	34/9	8	8	36/6	+1/-	4 7 8
Overseas Electricity Companies							
Atlas Elec.	4/3	2/-	Nil	Nil	2/9	—	—
Calcutta Elec.	39/-	34/6	10*	10*	34/6	−6d.	—
Cawnpore Elec.	34/6	28/3	10	10	28/3	—	7 1 7
East African Power	26/3	22/6	7	7	25/-	—	5 14 0
Jerusalem Elec.	24/6	23/3	5	6	24/-	—	5 0 0
Kalgoorlie (10/-)	10/6	9/6	7½	7	10/3	—	7 6 4
Madras	31/-	28/6	8*	8*	28/9	−¼	5 11 4
Montreal Power	34½	31	1½	1½	33	—	—
Palestine Elec. "A"	29/6	26/3	7½*	7½*	27/-	+9d.	5 11 1
Perak Hydro-electric	18/9	15/-	7	6	15/-	—	8 0 0
Shawinigan Power	23½	20	85cts.	83cts.	22	+½	—
Tokyo Elec. 6%	61	50	6	6	51½	+1	11 13 0
Victoria Falls Power	72/-	60/-	12	13½	67/6	+¼	4 0 0
Whitehall Investments Pref.	19/6	16/-	7½	7½	17/-	+6d.	8 16 6
Public Boards							
Central Electricity :							
1950–70	112	106	5	5	106½	—	4 14 0
1955–75	115½	108	5	5	108½	—	4 12 2
1951–73	106½	103½	4½	4½	105½	+1	4 5 4
1963–93	95½	86	3½	3½	89	+3	4 1 5
London Elec. Trans. Gtd.	88½	84	2½	2½	85½	—	2 18 6
London & Home Counties, 1955–75	107½	106½	4½	4½	107	—	4 4 1
Lond. Passenger Transport :							
A	114½	104¾	4½	4½	107½	—	4 3 9
B	117½	105	5	5	109½	+2	4 11 4
C	78½	64½	4½	4	70½	+2	5 13 6
West Midlands Joint Elec., 1948–68	112½	109	5	5	109½	—	4 11 3
Telegraph and Telephone							
American Tel. & Tel.	180	159	9	9	172½	+2	5 4 4
Anglo-Am. Tel. :							
Pref.	101½	89½	6	6	90½	+1	6 12 7
Def.	23⅜	19	1½	1½	20	+½	7 10 0
Anglo-Portuguese	24/-	19/9	8	8	21/3	—	7 10 7
Cable & Wireless :							
5½% Pref.	90½	75	4½	5½	90½	+5	6 1 8
Ord.	49	34	4	4	46½	+1	8 12 0
Income	100	95½	—	—	96	+½	4 3 4
Canadian Marconi $1	5/3	3/9	—	Nil	4/-	—	—
Globe Tel. & Tel. :							
Ord.	28/3	23/6	5½*	7½*	28/3	+9d.	5 6 3
Pref.	26/9	23/3	6	6	23/9	—	5 1 1
Great Northern Tel. (£10)	38	27½	20	20	33½	+3	5 19 4
Inter. Tel. & Tel.	10½	7½	Nil	Nil	7¾	+⅛	—
Marconi-Marine	29/-	23/-	7½	10	26/3	—	7 12 6
Oriental Telephone Ord.	2½	46/3	12*	12*	2 7/16	—	4 16 0
Radio Corpn.	8⅝	6	8	6	7	—	—
Telephone Props.	14/-	12/9	5	6	13/9	—	8 14 6
Telephone Rentals (5/-)	10/-	8/6	5	6	9/3	—	3 4 10
Western Union	25½	19½	2¾	—	20½	+½	—
Traction and Transport							
Anglo-Arg. Trams :							
First Pref.	7/6	3/6	Nil	Nil	6/3	−1/6	—
4% Inc.	16	7	Nil	Nil	13	+1	—
British Electric Traction :							
Def. Ord.	1000	700	5	5	900	—	—
Pref. Ord.	164	158	8	8	150	—	5 6 8
Bristol Trams	48/6	37/3	8	10	43/9	—	4 11 2
Brazil Traction	13	7⅞	$1	—	11	−⅛	—
Calcutta Trams	25/6	23/6	8	8	23/-	—	6 19 2
Cape Elec. Trams	18/-	16/9	5	6	17/6	—	6 17 2
Lancs Transport	36/6	32/6	10	10	32/6	—	6 3 1
Mexican Light :							
1st Bonds	25	21	5	5	25	—	—
Rio 5% Bonds	81	47	5	5	70	+5	7 2 10
Southern Rly :							
5% Prefd.	71	48	5	5	68½	+1	7 6 2
5% Pref.	97½	80	5	5	92½	+1	5 8 3
T. Tilling	48/-	39/6	10	10	45/-	+1/3	4 9 3
Tilling & B.A.	53/-	50/-	10	9*	52/6	—	3 8 7
West Riding	37/9	31/3	10	10	33/9	+1/9	—
Equipment and Manufacturing							
Aron Electricity Ord.	32/3	28/9	15	15	28/9	—	10 0 0
Assoc. Elec. :							
Ord.	45/3	34/9	10	10	38/-	—	5 5 3
Pref.	36/6	34/-	8	8	33/9	+⅛	4 11 10
Automatic Telephone & El.	46/6	39/3	10	12½	46/3	+½	5 8 3
Babcock & Wilcox	42/9	37/-	10	12½	44/6	+2/-	5 13 1
British Aluminium Ord.	57/-	48/9	12½	12½	57/6	—	4 7 0
British Insulated Ord.	88/-	77/-	20	20	4⅛	+⅛	4 18 6
British Thermostat (5/-)	16/-	12/-	18½	18½	13/3	—	6 19 7
British Vacuum Cleaner (5/-)	22/6	18/6	40	40	18/9	—	—
Brush Ord.	5/9	4/6	Nil	Nil	5/-	—	—
Callender's	92/-	67/6	20	15	67/6	−¼	4 9 0
Chloride Elec. Storage	82/3	73/-	15	20	3¾	—	5 6 8
Consolidated Signal	96/-	80/9	36½	36½	82/6	—	8 16 9
Crabtree (10/-)	25/6	21/6	17½	17½	22/6	—	7 15 7
Crompton Parkinson :							
Ord. (5/-)	21/-	14/9	12½	15	17/6	—	—
E. K. Cole (5/-)	9/-	4/-	5	10	5/3	—	9 10 6
Elec. & Musical Industries (10/-)	14/9	8/9	10	5	11/3	−3d.	4 9 0
Electric Construction	38/6	30/6	10	12½	35/-	—	7 2 10
Enfield Cable Ord.	58/6	2½	25	16½	50/-	—	6 10 0
Electrical Switchgear (10/-)	27/-	23/9	16	16	23/9	—	6 14 9
English Electric	36/-	30/3	10	10	34/-	—	5 17 8
Ensign Lamps (5/-)	14/6	13/9	—	25	14/-	—	8 18 6
Ericsson Tel. (5/-)	43/-	35/-	25*	25*	40/-	−⅛	3 2 6
Ever Ready (5/-)	24/-	19/3	35	30	19/6	—	7 14 0
Falk Stadelmann	27/-	22/6	10	10	22/6	−½	8 18 0
Ferranti Pref.	25/6	23/6	7	7	24/-	+1/6	5 16 8
G.E.C. :							
Pref.	31/9	29/3	6½	6½	27/6	—	4 14 6
Ord.	82/-	70/9	17½	20	80/-	—	5 0 0
Greenwood & Batley	27/6	24/6	7	15	26/3	—	11 8 2
Hall Telephone (10/-)	22/3	19/3	15	15	20/9	+⅛	7 4. 7
Henley's (5/-)	21/-	17/9	20	20	18/9	—	5 6 8
4½% Pref.	23/-	21/6	4½	4½	22/6	—	4 0 0
Hopkinsons	44/6	37/3	12½	15	44/6	+½	6 14 6
India-Rubber Pref.	21/-	20/-	5½	5½	21/3	—	5 3 6
Intl. Combustion	117/-	97/-	32½	32½	5⅞	—	5 17 0
J. Lucas	60/-	52/-	15	15	57/6	—	5 4 4
Johnson & Phillips	41/-	32/-	12½	12½	37/6	—	6 13 6
Lancashire Dynamo	68/-	60/-	25	25	60/-	—	8 6 8
Laurence Scott (5/-)	12/-	10/-	15	15	10/-	—	7 10 0
London Elec. Wire	31/6	29/-	12	7½	29/6	—	5 1 8
Mather & Platt	50/-	42/6	13½	13½	46/3	+⅛	5 17 0
Metropolitan Elec. Cable Pf.	21/3	21/-	5½	5½	21/3	—	5 3 6
Murex	85/9	63/9	20	20	76/3	+⅛	5 5 0
Pye Deferred (5/-)	13/9	7/6	5	25	10/-	—	12 10 0
Revo (10/-)	35/6	32/3	12	17½	33/9	+⅛	5 3 8
Reyrolle	61/-	52/6	12½	12½	56/3	—	4 9 0
Siemens Ord.	26/9	20/6	7½	7½	22/6	—	6 13 6
Strand Elec. (5/-)	5/6	4/9	5	10	5/-	—	10 0 0
S. Smith (1/-)	9/9	6/-	37½	50	8/9	+⅛	5 14 3
Switchgear & Cowans (5/-)	15/-	11/3	20	20	11/3	—	8 18 0
Telegraph Condenser (10/-)	7/6	5/-	5	—	7/6	—	—
Telegraph Construction	2½	37/6	10	10	37/6	—	5 6 8
Telephone Mfg. (5/-)	10/-	8/-	9	9	8/6	—	5 6 0
Tube Investments	91/-	82/9	23¾	23¾	87/-	—	5 10 4
Vactric (5/-)	4/3	2/3	10	4	3/6	−6d.	5 14 4
Vickers (10/-)	24/6	19/6	10	10	19/6	—	5 2 7
Westinghouse Brake	54/9	43/9	17½	17½	46/3	—	7 11 4
Walsall Conduits (4/-)	31/9	24/-	55	55	26/3	—	8 7 8
West, Allen (5/-)	7/6	5/9	7½	10	6/3	−3d.	8 0 0

* Dividends are paid free of Income Tax.

NEW PATENTS

Electrical Specifications Recently Published

Compiled by a firm of chartered patent agents. The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1936

34066. "Synchronised electron - discharge valve oscillator circuits." Standard Telephones & Cables, Ltd., and R. M. Barnard. October 15th, 1937. (504015.)

1937

12942. "Control circuits for polyphase vapour arc convertors." General Electric Co., Ltd., and C. R. Dunham. July 6th, 1937. (504174.)

19630. "Cathode-ray tubes." Radioakt. Ges. D. S. Loewe. July 16th, 1936. (503954.)

19671. "Television reception." E. P. Rudkin and G. M. Hellings. July 15th, 1937. (Cognate application 21242/37.) (504263.)

19761. "Cathode-ray tubes." O. Klemperer. July 16th, 1937. (504109.)

22754. "Voltage - control circuits." Kodak, Ltd., and W. F. Berg. August 19th, 1937. (504112.)

24602. "Electric circuit timing-device." Igranic Electric Co., Ltd. September 11th, 1936. (504020.)

24806. "Electrodeposition of nickel on metals." J. G. Fife (Deutsche Gold- und Silber Scheidenstalt vorm. Rossler). September 11th, 1937. (Convention date not granted.) (503956.)

24838. "Electric wave filtering systems." W. S. Percival. September 13th, 1937. (504021.)

24839. "Electrical control of tuning mechanism for radio apparatus." F. A. Mitchell. September 13th, 1937. (504022.)

25295. "Electrical testing arrangements, including cathode-ray oscillographs." Marconi's Wireless Telegraph Co., Ltd. September 17th, 1936. (504179.)

25395. "Electric generators." Continental Motors Corpn. September 19th, 1936. (504180.)

28009. "Arc-lamp irradiating apparatus for therapeutic purposes." A. Stahn. October 14th, 1937. (Convention date not granted.) (504115.)

28152. "Adjusting devices for the contacts of electromagnetic vibrators for high-frequency electro-medical apparatus and the like." C. A. Cooper. October 15th, 1937. (504345.)

28238. "Electric spot welding apparatus." D. Sciaky. November 9th, 1936. (504346.)

28275. "Lighting systems." R. R. Hoare. October 18th, 1937. (Cognate application 28680/37 and 9953/38.) (504027.)

28297. "Wireless receivers." Telefunken Ges. für Drahtlose Telegraphie. October 17th, 1936. (504029.)

28331. "Electrodes for high-pressure mercury - vapour discharge devices." General Electric Co., Ltd., and V. J. Francis. October 18th, 1937. (504120.)

28462. "Electric-discharge devices and the envelopes thereof." Standard Telephones & Cables, Ltd., and W. T. Gibson. October 19th, 1937. (504123.)

28506. "Electrolytic cells." British Electrolytic Condenser Co., Ltd., G. C. Gaut and D. J. P. Phillips. October 19th, 1937. (504280.)

28507. "Electrolytic cells." British Electrolytic Condenser Co., Ltd., G. C. Gaut, D. J. P. Phillips and B. F. Huggings. October 19th, 1937. (504281.)

28570. "Methods of constructing mosaic electrodes." Baird Television, Ltd., and E. B. King. October 20th, 1937. (Cognate application 9627/38.) (504188.)

28607. "Tuning arrangements for high-frequency electrical apparatus." Telefunken Ges. für Drahtlose Telegraphie. October 20th, 1936. (504190.)

28624. "Sources of light comprising an electric-discharge and luminescent material excited by the discharge." General Electric Co., Ltd., and A. H. McKeag. October 20th, 1937. (504354.)

28634. "Electrolytic cells." British Electrolytic Condenser Co., Ltd., G. C. Gaut, D. J. P. Phillips and B. F. Huggins. October 20th, 1937. (504282.)

28885. "Diaphragms for loud speaker telephones." Murphy Radio, Ltd., and A. K. Webb. October 22nd, 1937. (504129.)

28921. "Radio direction or position finding." H. A. Thomas. October 22nd, 1937. (504293.)

29025. "Methods of manual electric welding." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. October 26th, 1936. (504195.)

29032. "Thermionic valve apparatus." R. L. Fortescue. October 23rd, 1938. (504196.)

29236. "Manufacture of grids for use in electron-discharge devices." J. D. McGee. October 26th, 1937. (504200.)

29268. "Construction of and methods of producing inductance coils." Porzellanfabrik Kahla. October 26th, 1936. (Cognate application 29269/37.) (504201.)

29323. "Electric switch - operating handles or knobs." C. A. Turner and H. Diamond Switches, Ltd. October 27th, 1937. (504202.)

29398. "Carrier signalling systems." Telephone Mfg. Co., Ltd., L. H. Paddle and J. G. Flint. October 27th, 1937. (504300.)

29983. "Compressed-gas operated electric switches." General Electric Co., Ltd., and C. C. Garrard. November 2nd, 1937. (504305.)

30170. "Electric-discharge lamps." British Thomson-Houston Co., Ltd., H. K. Bourne and C. Gilson. November 3rd, 1937. (503970.)

30398. "Electric fans." General Electric Co., Ltd., and H. C. E. Jacoby. November 5th, 1937. (503971.)

30916. "Protection of electric cables." T. F. Altham. November 11th, 1937. (503972.)

31976. "Telephone instruments." Ericsson Telephones, Ltd., G. R. Newell and F. Hollis. November 20th, 1937. (504049.)

32190. "Electrical plug-and-socket connections." C. H. Parsons, Ltd., and G. B. Handley. November 23rd, 1937. (504050.)

32721. "Devices sensitive to the direction of propagation of electro-magnetic waves." Standard Telephones & Cables, Ltd. December 24th, 1936. (504052.)

33013. "Overload release units for automatic circuit-breakers and similar electrical switchgear." J. A. Crabtree & Co., Ltd. (Schiele Industriewerke). November 30th, 1937. (503977.)

33623. "Electric switch contacts particularly for alternating-current circuits." C. L. Arnold and M. K. Electric, Ltd. December 4th, 1937. (504053.)

33738. "Electric fuses." A. D. Ferguson, and Metropolitan-Vickers Electrical Co., Ltd. December 6th, 1937. (503980.)

34552. "Electric cables." Pirelli-General Cable Works, Ltd., and R. E. S. Soper. December 14th, 1937. (504209.)

34607. "Protection of electrical apparatus." English Electric Co., Ltd., and A. T. Chadwick. December 14th, 1937. (504310.)

34805. "Electric-lamp holders." J. A. Crabtree & Co., Ltd., H. F. McLoughlin and B. G. Harrison. December 16th, 1937. (504055.)

34996. "Electric circuits adapted to operate electric - discharge devices." General Electric Co., Ltd. (Patent-Treuhand-Ges. für Elektrische Glühlampen.) December 17th, 1937. (503984.)

35097. "Electric over-current circuit-breakers with thermal relays." Etablissements Bresson and S. J. B. Thomas. February 25th, 1937. (504136.)

1938

430. "High-tension multi-break circuit breaker." Allmanna Svenska Elektriska Aktiebolaget. January 7th, 1937. (504138.)

884. "Electric - discharge devices." General Electric Co., Ltd., and D. G. Prinz. January 11th, 1938. (Addition to 474264.) (503990.)

1595. "Thermionic valve circuits." Siemens Bros. & Co., Ltd., and P. A. Chittenden. January 18th, 1938. (504141.)

1806. "Electric fuse-holders." S. L. Lightfoot (trading as Standard Fuse Co.). January 19th, 1938. (504143.)

3503. "Radio direction-finding receivers." Telefunken Ges. für Drahtlose Telegraphie. February 4th, 1937. (504060.)

11740. "Communication systems, particularly printing-telegraph systems." A. H. Stevens (International Business Machines Corpn.). April 19th, 1938. (504156.)

13325. "Electric resistances and methods of making such resistances." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. May 7th, 1937. (504160.)

15475. "Wireless antenna systems." R. J. Berry (C. Lorenz Akt. Ges.). May 24th, 1938. (504163.)

16133. "Automatic signal interference control for radio receivers." Hazeltine Corpn. June 18th, 1937. (504229.)

16134. "Automatic fidelity control for radio reception." Hazeltine Corpn. June 18th, 1937. (504230.)

16311. "Printing telegraph receiver." E. E. Kleinschmidt. June 25th, 1937. (504231.)

18218. "Lighting standards for roadways and the like." Concrete Utilities, Ltd., C. A. Marques and F. Thomas. June 20th, 1938. (504325.)

18798. "Telephone and like transmission systems." Standard Telephones & Cables, Ltd. July 22nd, 1937. (504169.)

18802. "Electric signalling systems." Standard Telephones & Cables, Ltd., E. P. G. Wright and C. B. V. Neilson. October 19th, 1937. (Divided out of 489545.) (504237.)

19177. "Ultra-high-frequency apparatus." Marconi's Wireless Telegraph Co., Ltd. July 28th, 1937. (504238.)

21842. "Thermionic amplifiers." C. Lorenz Akt. Ges. July 22, 1937. (504091.)

22880. "Electron-discharge device amplifiers." Marconi's Wireless Telegraph Co., Ltd. September 30th, 1937. (504247.)

23707. "Apparatus for the electrical transmission at a distance of rotary velocities." Hasler Akt. Ges. Werke für Telephonie und Prazisions-Mechanik. August 30th, 1937. (504248.)

25935. "Radio direction-finders." Telefunken Ges. für Drahtlose Telegraphie. September 8th, 1937. (Addition to 498995.) (504253.)

27173. "Electric welding." B. Berghaus. October 9th, 1937. (Cognate applications 27174/38, 27175/38 and 27176/38.) (504100.)

29689. "Electric testing methods and apparatus therefore." C. Lorenz Akt. Ges. October 13th, 1937. (504258.)

37628. "Electron-discharge devices." British Thomson-Houston Co., Ltd. December 20th, 1937. (504107.)

2152. "Variable-inductance tuning devices." P. R. Mallory & Co. Inc. August 8th, 1936. (Divided out of 502172.) (504014.)

TRADE MARK APPLICATIONS

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from May 10th:—

Rythmatic. No. 602358. Class 9 (IV). Electrical instruments and apparatus used in systems of remote switching by means of control currents imposed on electric supply mains.—Automatic Telephone and Electric Co., Ltd., Norfolk House, Norfolk Street, W.C.2.

Omco. No. 602965. Class 9 (IV). Rheostats, electrical resistances, switches and choking coils.—D. T. Siegel, Chicago, U.S.A. (British representatives: Frank Heaver, Ltd., Bush House, Aldwych, W.C.2.)

Bryteco. No. 604903. Class 11 (IV). Lamp shades, not of metal.—Bryterlite Electrical Co., Ltd., 43, Robertson Street, Glasgow.

Roskydal. No. 605075. Class 17 (IV). Varnishes for insulating purposes.—I. G. Farbenindustrie Gesellschaft, Frankfurt-am-Main, Germany. (British representatives: Abel & Imray, 30, Southampton Buildings, Chancery Lane, W.C.2.)

CONTRACT INFORMATION

Particulars of work for which tenders are invited, contracts placed, and building schemes promising work for electrical contractors and traders

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses. Further details of items marked with an asterisk can be obtained from the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.1.

Aberdare.—May 19th. U.D.C. Switchgear and extra-high-voltage cable. (May 12th.)

May 27th. Cables, switchgear and transformers. (See this issue.)

Aberdeen.—May 24th. County Council. Electrical work at St. Fergus housing estate. County Clerk.

Belfast.—June 2nd. Electricity Department. 145,000 tons of coal, water cleaning screen, mild-steel galleries and stairways and an electrically operated lift at Harbour power station; steel poles for street lighting lanterns. (May 12th.)

Saturated steam pipework and valves for the Harbour power station. (See this issue.)

Birmingham. — June 2nd. Electric Supply Department. Extra-high-voltage metal-clad switchgear to Spec. No. SE.99. (See this issue.)

May 24th. 330-ft. high brick chimney stack at Hams Hall "B" power station. (See this issue.)

Burnley.—June 3rd. Electricity Department. Lighting installation in Parish Church. (May 12th.)

Dublin.—August 1st. Electricity Supply Board. Turf burning boiler plant and auxiliaries at a generating station near Portarlington, Co. Leix, also one 20/25,000-kW turbo-alternator and exciter with complete condensing and auxiliary plant. (See this issue.)

Ealing.—June 1st. Electricity Department. Jointing materials, general stores and pavement frames and covers for twelve months. (May 12th.)

Edinburgh.—June 2nd. Corporation. Electrical installation at Holy Cross Academy. Town Clerk.

Fraserburgh.—May 26th. Town Council. Electrical works at fourteen houses. Town Clerk (deposit £1).

Hastings.—June 2nd. Electricity Department. Boiler fuel for twelve months. (See this issue.)

Hereford.—May 26th. Electrical and engineering work at the County and City Mental Hospital, Burghill. (See this issue.)

Holmfirth.—May 26th. Electricity Department. High- and low-voltage cables.

June 2nd. Transwitch unit comprising extra-high-voltage switchgear, transformer and low-voltage fuses. (See this issue.)

Leeds.—June 1st. Sewerage Committee. Sewage-pumping equipment, comprising electrically driven centrifugal pumps, motors, control and switchgear, cables, cast-iron pipes, valves and instruments in the main pumping station, Low Level Works, Knostrop. Town Clerk's Office, Room 57, Civic Hall (deposit £2).

June 12th. Corporation. X-ray installation at St. James's Hospital. See this issue.)

London.—H.M. OFFICE OF WORKS.—May 31st. Electric wiring installation at Glascoed R.O.F. (May 12th.)

Newcastle-under-Lyme. — May 26th. Electricity Supply Department. Three extra-high-voltage switch cubicles, and e.h.v. and l.v. metering equipment for sub-station. (May 12th.)

Merton and Morden.—May 31st. U.D.C. Diesel-electric stand-by plant at the West Barnes sewage pumping station. (See this issue.)

New Zealand.—AUCKLAND.—May 29th. Electric Power Board. 2,000 yd. of 4-core, 0.04 sq. in. cable, 4,000 yd. of 4-core, low-voltage cable, and 5,000 yd. of 4-core special low-voltage cable. (T. 21821/39.)*

WELLINGTON.—June 7th. Public Works Department. Six 11,000/460/230-V single-phase transformers. (T. 21908/1939.)* 260 highway lighting units. (T. 21907/1939.)*

Newcastle-on-Tyne. — North - Eastern Housing Association. Electrical installation at forty-four houses at Spennymoor. G. H. Gray, architect, 50, Camden Street, North Shields.

Newport.—June 1st. Electricity Department. Civil engineering works, including pipework and river outfall, in connection with additional circulating water supplies at the East power station. (May 12th.)

June 5th. Extra-high and low-voltage transmission lines for electricity supplies in the Magor Rural District. (See this issue.)

June 13th. Directors. Electrical installation and equipment at the Royal Gwent Hospital.

Plymouth. — May 27th. Electricity Supply Department. Two 33,000/6,600-V transformers and auxiliary apparatus. (May 12th.)

Reigate.—June 10th. Electricity Department. Four sheet-steel kiosks complete with high- and low-voltage switchgear and six 400-kVA transformers. (See this issue.)

June 10th. Extra-high voltage and low-voltage cables. (See this issue.)

Salford.—May 24th. City Council. Complete electrical installation in the proposed new branch library, Liverpool Street, Seedley. City Electrical Engineer, Electricity Department, Frederick Road.

South Africa.—JOHANNESBURG. — May 20th. City Council. 1,300 300-A, 6,600-V isolating links for use in pillar boxes. (T. 21877/39.)*

July 11th. Rand Water Board. One 3,000-kW steam turbine, together with condenser and auxiliary valves and instruments, cables and wiring. (T. 22297/39.)*

July 14th. Electricity Supply Commission. 40,000-kW turbo-alternator and condensing and auxiliary plant for Congella power station. (T. 22298/39.)*

PRETORIA.—May 25th. Union Tender and Supplies Board. Five 60-gal. and two 30-gal. automatic electric water heaters. (T. 21751/39.)*

June 1st. One 100-kVA alternator and one automatic voltage regulator. (T. 22296/39.)*

CAPE PROVINCE.—June 1st. Gordons Bay Village Management Board. One 60-kVA transformer and one automatic line voltage regulator. (T. 22580/1939.)*

Spenborough.—May 25th. Electricity Department. 2,300 yd. of 11,000-V cable and a similar length of multi-core pilot cable. (May 12th.)

Stockton-on-Tees.—June 6th. Electricity Department. One 750-kVA and two 500-kVA transformers. (See this issue.)

Stornoway.—May 24th. Town Council. Electrical work at seventy-four houses. Town Clerk (deposit £2 2s.).

Stretford.—May 20th. Borough Council. Switchboard, alarm equipment, &c., for new central fire station and adjacent houses. Borough surveyor, Town Hall (deposit £2 2s.).

Swansea.—May 27th. Electricity Department. Mercury-arc rectifier equipment. (May 12th.)

Tredegar.—June 3rd. U.D.C. Automatic fire-fighting system for the Central sub-station and two manual systems for the North and South sub-stations. (See this issue.)

Uruguay. — MONTEVIDEO.— June 5th. State Electricity Supply and Telephones Administration. Fifty-two oil-cooled, three-phase, outdoor-type potential transformers, with spares. (T. 21720/1939.)*

May 22nd. Metering, control and regulation apparatus for generating sets at various power stations. (T.Y. 21721/39.)*

Weymouth and Melcombe Regis.—May 30th. Electricity Department. Extra-high-voltage switchgear and transformers. (May 12th.)

Worsley.—May 20th. U.D.C. Electrical installation in forty-two houses on the Peel Lane estate, Little Hulton. H. Lomax, Clerk of the Council, Town Hall, Walkden, near Manchester (deposit £1 1s.).

Orders Placed

Aberdeen.—Housing Committee. Accepted. Electrical work at South Mount Street housing estate.—Aiken & Smith.

Darlington.—Town Council. Accepted. Replacement of switchgear at the electricity undertaking. (£3,066).—Ferguson Pailin.

Accepted. Cables in connection with extensions to the electric power station (£7,470).—Callender's.

East Ham.—Electricity Committee. Accepted. Switch panel (£292).—Switchgear & Cowans. Whitta Road sub-station: One five-panel truck-type switchboard (£425).—Crompton Parkinson & Co. One 750-kVA transformer (£405).—English Electric Co. Wanstead sub-station: One "A" type ring main unit (£87).—Crompton Parkinson. Manor Park showroom sub-station: One three-panel cubicle switchboard (£279).—Crompton Parkinson & Co.

Great Yarmouth.—Electricity Committee. Accepted. Two air-cooled reactors (£244 each).—British Electric Transformer Co.

Lichfield.—Electricity Committee. Accepted. Conductors.—Henley's. Cables.—Standard Telephones & Cables. Street lamps.—G.E.C.

London.—METROPOLITAN WATER BOARD.—Recommended. Electrically operated needle valves (£2,250). — Guest & Chrimes.

L.C.C.—Accepted. Electrical installation at further blocks of dwellings on the Pembury estate, Hackney (£2,735).—Pemberton & Sturgess.

Manchester. — Education Committee. Accepted. Electrical extensions at Levenshulme High School for Girls.—A. Loudon.

Electricity Committee. Accepted. Multicore wiring for Barton emergency control board.—Hackbridge Cable Co.; Mersey Cable Works. Mercury-arc rectifier equipments for trolley bus sub-stations.—Hewittic Electric Co. Transformers.—Hackbridge Electric Construction Co. Electric street lanterns and auxiliary gear.—Wardle Engineering Co.

Watch Committee. Accepted. Radio equipment for police stations and police vehicles.—G.E.C.

Paisley. — Town Council. Accepted. Electrical installation at 513 houses at Gallowhill (£3,282).—Wm. A. S. Lang.

Portsmouth.—Electricity Committee. Accepted. One 15,000-kVA transformer (£6,700).—British Electric Transformer Co. 33,000-V cable connection to new switchhouse with various sub-stations.—Johnson & Phillips. Transformers: Six 400-kVA (£500 each).—Ferranti. Two 100-kVA (£82 each).—Bryce, Ltd. One 25-kVA (£46).—Bonar, Long & Co. 17,500 yd. of extra-high-voltage cable (£267).—Johnson & Phillips.

West Hartlepool.—Town Council. Accepted. High-voltage switchboard for the Dyke House sub-station (£1,094) and a switchboard for the Thornhill sub-station (£648).—A. Reyrolle & Co.

Worcestershire.—Education Committee. Accepted. Electrical installation at West Malvern open-air school (£117).—Hall Bros. Electrical installation at Halesowen senior school (£275).—Abell & Smith's Electrical Co.

Standing Joint Committee. Accepted. 500 electric torches.—Abell & Smith's Electrical Co.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Accrington.—Senior school in Thorneyholme Road; borough engineer.

Alnwick.—Houses (44); J. Sample, builder, Woodlands, Warkworth.

Ashton-under-Lyne.—Houses (34), Bengal and Deamond Streets; W. Wilson, borough surveyor.

Ayr.—Premises in Main Street for Kilmarnock Co-op. Society (£6,000).

Barnard Castle.—Houses (65); R.D.C. surveyor.

Berkshire.—Dry Sandford junior council school (£6,723); F. J. Minns & Co.; builders, Oxford.

Birmingham.—Heating installations at Council estates (£439,920); city engineer.

Bishopbriggs.—Factory on Crofthead Farm estate, for the Merrylee Tile Co.

Blackpool.—Fire station (£84,000). Houses (28), Kildare Road; R. Fielding & Son.

Blyth.—Houses (66), in various parishes (£23,600); R.D.C. surveyor. Hospital, for Thomas Knight Memorial Hospital; Newcombe & Newcombe, architects, 23, Eldon Square, Newcastle-on-Tyne.

Bournemouth.—Houses (63), Haddon Hill; Fox & Sons.

Brierley-Grimthorpe.—School (£43,318), for West Riding E.C.; F. L. Charlton, architect, 21, Bond Street, Leeds, 1.

Brighton.—Theatre (£70,000), North Street, for Southern Counties Theatres; L. F. Richardson, contractors, 34, Mount Ephraim Road, S.W.16.

Bristol.—Houses (160), Plummers Hill, St. George; borough surveyor. Works, Whitson Street, for Bristol Tramways & Carriage Co.

Bromsgrove.—Clinic (£4,593); J. & A. Brazier.

Cannock (STAFFS).—Houses (64), John Street, Wimblebury. Bungalows (18) and houses (68), Mount Street, Bradbury, Hednesford; S. Harrison, architect, Council House.

Cardiganshire.—Girls' county school (£32,000), Aberystwyth, for E.C.; Rhys Jones, county architect, Llandyssul.

Castle Bromwich.—Houses (53), Bentley, Marlborough and Clifton Roads; A. Walker & Son.

Cheshire.—Maternity child welfare centre adjacent to the Council Offices at Bollington, for the C.C.; contractors, Vernon & Smith, Chester Road, Hazel Grove, near Stockport.

Chester.—Royal Infirmary, extensions (£165,000).

Congleton.—Houses (40), junction of Boundary Lane and Congleton Edge Road; W. Jackson Trustees.

Coventry.—Houses (27), Wilderoft Road, off Broad Lane, for W. C. Stephenson, Westwood, Peterfield Road, Hall Green, Birmingham. Houses (28) and new street, Hollow Farm estate, for A. E. Simmons, 18, Conrad Road. Houses (50), Hipswell Highway, off Ansty Road and Longfellow Road, for the Geoffrey Lewis Estates, Hipswell Highway.

Cumberland.—County sanatorium, Orton Park, for the C.C.; county architect, Alfred Street North, Carlisle.

Darlington.—Hotel at Blackwell; Dougill & Sons, contractors, Chestnut Street

Dartford.—Houses (46), off Lowfield Street; Cooper Estates. Houses (36), James Road; Young & Young. Houses (44), off Dartford Road; J. Smith.

Denbigh.—Extensions to the North Wales County Mental Hospital, for Committee of Visitors; Lockwood, Abercrombie & Saxon, architects, 2, Stanley Street, Chester.

Dorchester.—Shops, offices and flats, Trinity Street; Marsh & Wynne.

Douglas (I.O.M.). — Extensions to Noble's Hospital; Governors. Houses (160), Ballakermeen estate; McCormick & Davies.

Dudley Colliery (NORTHUMBERLAND).—Welfare hall for the Miners' Welfare Committee (£5,000); T. J. Rochester. builder, Seaton Delaval, Northumberland.

Dukinfield.—Houses (100), Victoria Farm site, for the T.C.; J. Ridyard & Sons, contractors, Railway Saw Mills, Ashton-under-Lyne.

Durham.—Houses (26), at Shadforth and Kelloe, for the R.D.C.; H. Pescod, housing architect.

Eastleigh.—Houses (31), off Chalvington Road, Chandler's Ford; Amos Danby & Sons. Houses (28), off Chalvington Road, Chandler's Ford; Baxter & White.

Enfield.—Rebuilding Enfield War Memorial Hospital (£100,000), for Committee; C. W. Reeves, architect, 3, Gray's Inn Square, London, W.C.1.

Esher.—Extensions to Church central school (£7,292); Cropley Bros.

Glasgow.—Covered market and ice rink, Moncur Street; Mrs. Margaret McIver. Houses (560), at Greenfield, for Corporation; architect, Housing Department. Houses (626), North Cardonald; Housing director.

Halifax.—Houses (72), Charleston estate (£28,751); borough engineer.

Hastings. — Crematorium (£11,500); H. W. Hobbis, architect, Birmingham.

Hatch End.—Houses (250), Harrow-Watford Road, for Artisans and General Dwellings Co., Cromwell Road, South Kensington; M. T. E. Jackson, staff architect.

Haydock (LANCS).—Houses (102), and six bungalows on Wagon Lane site, for the U.D.C.; H. Horridge & Co., contractors, Wargrave Road, Earlestown.

Hendon.—Cinema, east side of Finchley Road, N.W.11, for Ionic Theatres, Ltd.; W. J. King, architect. Houses (120), Brent Hill, for T.C.; A. O. Knight, architect, The Burroughs, London, N.W.4.

Henley.—War Memorial Hospital extensions (£2,000).

Hillmorton.—Senior school (£26,700); Bosworth & Wakefield.

Hove.—Police station and courts (£41,000); borough engineer.

Ilford.—Houses (300), Little Heath estate, for R. Stroud; G. F. Siegerts, architect, 2, Oakfield House, Oakfield Road.

Kendal.—Houses (324), Sandilands estate (£123,867); borough engineer.

Kilmarnock.—Warehouse (£38,000), Hill Street, for John Walker & Sons, Ltd.; J. Nicholson, director of the Distillerys Co.

Kingsbury (WARWICKSHIRE). — Senior school (£17,742); H. J. Bray.

Kirkham (LANCASHIRE).—Senior school (£25,000), for managers; F. Thorpe & Whyman, architects, Oldham.

Lanarkshire.—Houses (140), Springhill, Shotts, for C.C.; county architect.

Leamside (CO. DURHAM).—Hospital for Durham Orthopædic Association (£120,000); W. & T. R. Milburn, architects, 17, Fawcett Street, Sunderland.

Liverpool.—Schools, Speke, and Olive Mount, Wavertree, for T.C.; Director of housing, Blackburn Chambers, Dale Street. Houses (340), shops, &c., at Speke; City architect, Dale Street.

London.—(HAMMERSMITH). — Cottages (9), M.W.B. Waterworks (£8,033); W. J. Hallt.

Lymington. — Elementary school (£52,130); Hants Education Committee.

Market Harborough.—Nurses' home, Institution (£4,557); H. Herbert & Sons.

Matlock.—Houses (44), at Cromford housing site; J. Turner, surveyor.

Meriden.—Houses (80), on Onion field site, Coleshill; H. Pickering, surveyor, The Town Hall, Coleshill.

Midhurst.—Houses (20), parishes of Midhurst, South Harting and Trotton for R.D.C.; T. Greenfield, architect, Newstead.

Neath.—Houses (102), Westernmoor, for T.C.; H. A. Clarke, borough engineer, Gwyn Hall.

Newcastle-on-Tyne.—Church of England School at St. Anthony's; C. S. Errington, architect, 46, Grainger Street.

North Riding.—Additions to Eston Victoria Street School, for the C.C.; county architect, County Hall.

Northallerton (YORKS). — School (£29,113); W. Birch & Sons, builders, York City.

Norwich.—Houses (52), Southwell Road-Trafalgar Street clearance area, for T.C.; city architect's office, City Hall.

Odiham.—Enlargement of Bury Fields school (£12,250); Hants Education Committee.

Oswestry. — Houses (36) at Weston Rhyn; C. B. Barnes, surveyor, Council Offices, Castle View.

Oxford.—Houses (40), Canning Crescent estate and Upper Farm, Wolvercote, for T.C.; A. Carstairs, city engineer, Town Hall.

Plymouth.—Houses (46), Oates Road; St. Aubyn Estates. Houses (84), Vicarage Gardens; Davis Estates.

Polegate.—Cinema, site of old Horse and Groom, with shops; Roberts & Rowse, architects, 3, Albemarle Street, London, W.1.

Port Talbot.—Houses (66), on various estates (£25,092); borough engineer.

Rossington (YORKS).—Infants' school and clinic, for West Riding E.C. (£23,687); G. Drysdale, architect, 102, Great Russell Street, London, W.C.1.

Rosyth.—Houses (135), King's Road; Scottish National Housing Co.

Rothwell. — Houses (40), Empress Street; E. Appleyard.

Rugby.—Senior school in Bilton Road (£21,270); W. H. Adams & Sons.

Ruthin. — County offices (£80,000); County architect.

St. Albans.—Houses (38), Milehouse Lane; J. Graham.

Scarborough. — Cemetery (£26,320); borough engineer.

Sheffield.—Church of St. James and St. Christopher, Shire Green, for the Sheffield Diocesan Board and Rev. J. G. Sutton, vicar (£12,000); T. Wilkinson & Sons (Builders), Ltd., contractors, Olive Grove Works, Midhill Road.

Staines.—Flats (90), off Kingston Road, Laleham; Bunting Construction Co.

Stirlingshire.—Houses (54), at Laurieston, for County Council; Wilson and Wilson, architects, Grangemouth.

Stratford-on-Avon.—Cinema, Warwick Road; Stratford-on-Avon Picture House Co.

Sunderland.—Houses (972), on the Springwell estate, for the North-Eastern Housing Association; J. E. Lewis, architect, Town Hall.

Surrey.—Extensions (£600,000), County Hospital, Kingston-on-Thames, for C.C.; Saxon, Snell & Phillips, architects, 9, Bentinck Street, W.1.

Sutton-in-Ashfield. — Houses (114), Skegby estate (£47,600); U.D.C. surveyor.

Swansea. — Fire station (£45,000); borough architect. Hospital for Welsh National Memorial Association, Wrexham (£250,000).

Swinton (YORKS). — Senior school (£62,336), for the West Riding E.C.; Gribbon, Froggitt & Brown, architects, 3, Park Place, Leeds, 1. Houses (166), Parkfield estate; J. Lane & Sons, Ltd., builders, Morpeth Street.

Timperley.—Cinema (£30,000), Park Road, for Warwick Cinemas (Timperley), Ltd.; Drury & Gomersall, architects, 11, Oxford Road, Manchester.

Trowbridge.—County offices (£160,000); Wilts C.C.

Ulverston. — Hospital at Todbusk; Lancs C.C.

Urmston.—Shops and offices, Stretford Road; Longworth & Taylor.

Wakefield.—Houses (170), off Bradford Road; J. R. Lister.

Walsall. — Houses (140), Coalpool Housing Site, Section 3, and disinfestation centre, garage and offices, Corporation Depôt, Station Street, Bloxwich, for T.C.; M. E. Habershon, borough surveyor, Council House.

Washington (CO. DURHAM).—Houses (60) (£20,880); T. G. Price, Springwell.

Watford.—Pumping station (£17,060); water engineer.

Wednesfield.—Council offices off High Street (£15,000); surveyor.

West Hartlepool.—Houses (156), Seaton Lane, and 182 at Dyke House (£133,221); borough engineer.

West Riding. — Modern school (£60,227), Elland, for E.C.; county architect, Wakefield.

Willerby (HULL).—Hotel (£60,000), for H. Wray; Col. J. G. Adamson, architect.

Williton.—Senior school (£31,054); Somerset Education Committee.

Windsor.—Houses (86), Clewer Manor Estate, Dedworth, and St. Leonards Road, Spital, for T.C.; F. N. McRae, borough engineer, 16, Alma Road.

Wirral.—Fire station buildings; surveyor, Council Offices, Heswall.

Wolverhampton.—Roller skating rink at Temple Street; E. A. Ward. School in Warstones Road (£37,656); H. J. Amies & Sons. Swimming bath, Elston Hall school; borough engineer.